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[redacted]

CONTENTS

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SECTION I

AIR

1. THE ME-323 TRANSPORT

The existence of a new GAF transport, the Me-323, has recently been confirmed. This high-wing monoplane appears to be a development of the "Gigant" glider, originally identified as the "Merseburg." In view of take-off difficulties believed to have been experienced with the latter, it is probable that the powered aircraft will supplant the glider version. The dimensions of the Me-323 tally exactly with those of the "Gigant," so far as known.

The Me-323 is of metal and plywood construction and has a welded-tube fuselage of the "two-deck" type, the upper deck being detachable for the transport of freight. The wing has a span of 178 feet, a length of 88 feet, a root chord of 27 to 28 feet, and a gross area of 3,200 square feet. It has plywood ribs, every other one of which is reinforced by metal profile welded to a single spar. Both fuselage and wing are fabric covered, plywood being used for the leading edge and extending over surfaces about three feet aft. Camber-changing flaps are employed.

The aircraft has a single fin and rudder. The tailplane, which has a span of about 50 feet, is fitted with an adjustable stabilizer. The landing gear is thought to have 10 wheels, 5 in tandem on each side of the forward part of the fuselage.

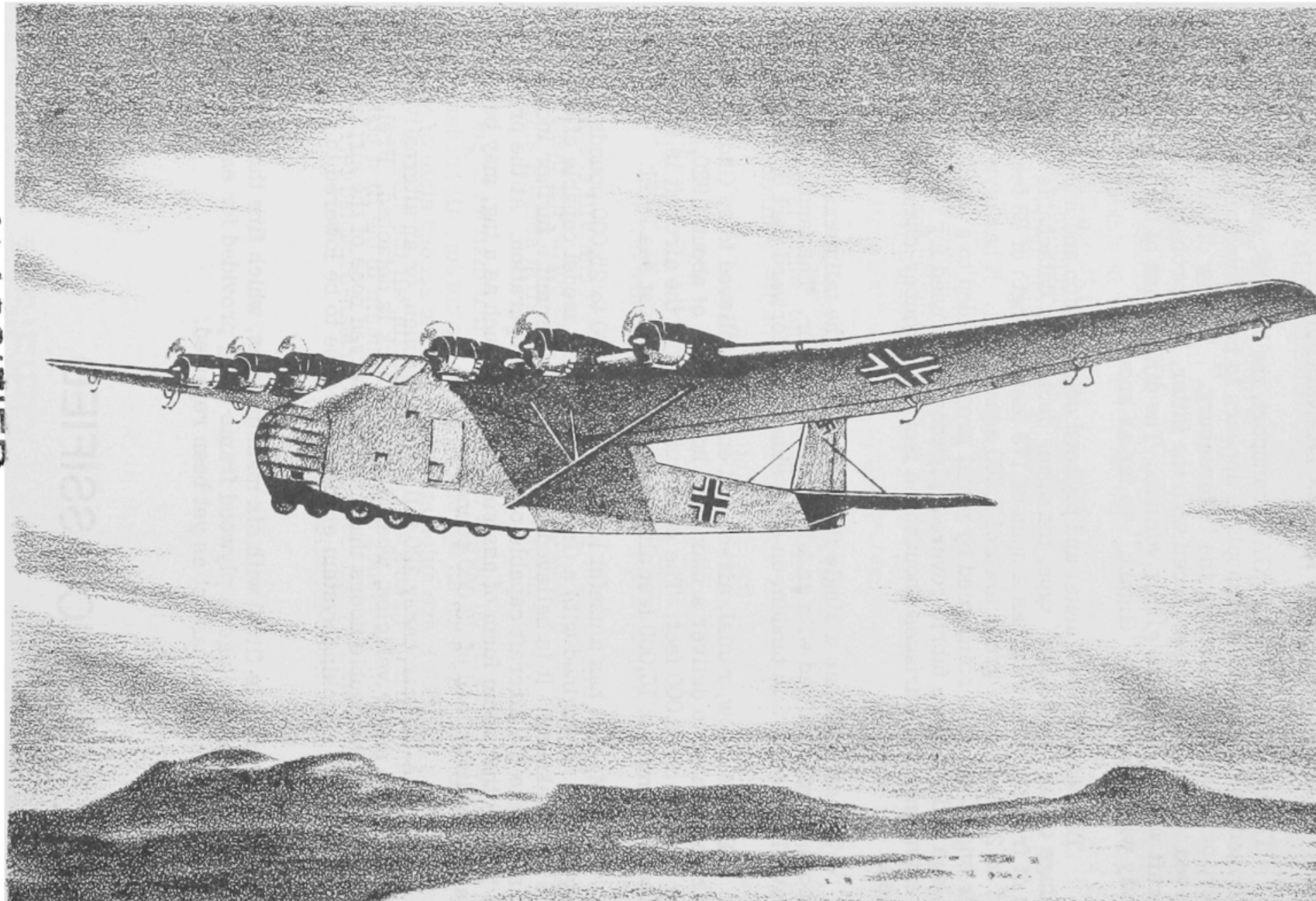
Six twin-row, radial, air-cooled engines, believed to be Gnome-Rhone 14 M, are estimated to deliver a maximum horsepower of about 4,920, or 820 each, at an altitude of 10,000 feet. The maximum speed of the aircraft is estimated to be about 160 mph at 10,000 feet altitude, and 140 mph at sea level.

The Me-323 has a useful load of from 20,000 to 25,000 pounds. It eventually may be re-engined with a Gnome-Rhone 14 M model capable of developing 1,085 hp at take-off. It is believed that this would permit a further increase in load and make the aircraft capable of independent operation. At the present time, it is thought that some form of assisted take-off, such as a tug, may be employed for a full military load of 22,000 pounds.

The Me-323 can carry 120 fully equipped men, or an alternative load of small tanks or motor vehicles, when the upper deck is detached. Freight is loaded through the double doors that form the curved nose of the airplane; this is accomplished by a jacking system enabling the nose to be lowered to a convenient height.

The aircraft is fitted with six machine guns, which fire through apertures in the sides of the fuselage, a plywood frame being provided for each aperture. Fore and aft armament has not as yet been reported.

UNCLASSIFIED



THE ME-323 TRANSPORT

UNCLASSIFIED

2. GERMAN AIR-RAID WARNING SYSTEM

Recent reports from German sources indicate that all of Germany and German-occupied countries are divided into air districts numbered I, II, III, etc. Listening devices on the coast or frontier detect the approach of enemy planes while they are still at a considerable distance from any German air district. These listening devices, it is said, can detect the motor noise of an enemy plane as far away as 175 miles. When the sound of the motor is picked up, those districts toward which the planes are flying are alerted first. In this preliminary alarm, all factory lights which are noticeable are extinguished, radio stations go off the air, and the crews of antiaircraft guns prepare for action.

As the planes approach the coast or frontier, it becomes evident toward which district the planes are flying. That district is then put in the second state of alarm, which means that the sirens are sounded and everybody goes to the air-raid shelters. All factory lights - including emergency lights - are extinguished, and everything is put into readiness by the antiaircraft crews.

In the case of a typical example, it may be assumed that hostile planes are approaching air district I (see accompanying map), which is then put in the second state of alarm, while all districts bordering on No. I (districts II, VII, and VIII) are automatically put in the first state of alarm.

As soon as the attacking planes enter district I, it is put in the third state of alarm (Hoechstalarm, or maximum alarm), meaning "the enemy is attacking." The antiaircraft guns begin to fire and pursuit planes take off.

At the same time, the bordering districts II, VII and VIII are automatically put in the second state of alarm, and all districts bordering these (in this case, IX, X, XII, and III) are automatically put in the first state of alarm.

If the attackers fly on toward the district II, that district is put in the third state of alarm. As soon as the planes cross its border, all bordering districts, including district I, are automatically put in the second state of alarm. If the planes continue further inland, e.g., toward Berlin, all the districts in the line of flight, and over which the planes have passed, remain in the first state of alarm until the planes have entirely left Germany and German-occupied ~~territory, and~~ the attack can be considered terminated.

3. GERMAN AA GUNS FOR USE AGAINST MECHANIZED VEHICLES

The Germans have made extensive use of their 20-mm and 88-mm antiaircraft guns for engaging mechanized vehicles. The 37-mm antiaircraft gun, though suitable for a dual-purpose role and provided with armor-piercing ammunition, has been used to a lesser extent. In addition to these three weapons, a German document shows that the use of four other antiaircraft guns against mechanized vehicles is envisaged. These guns are:

a. 40-mm AA/AT Gun (4-cm Flak 28 Bofors)

This Bofors-design gun is generally similar to the U.S. 40-mm Bofors. Some of the particulars of this weapon are reported as follows:

Muzzle velocity	2,950 f/s
Length of bore	60 cals
Max. horizontal range	12,300 yds
Effective ceiling	16,200 ft
Weight of projectile (HE)	2.2 lbs
Rate of fire (practical)	80 rpm
Weight in action	1.9 tons
Weight in traveling position	1.9 tons
Elevation	-5° to $+90^{\circ}$
Traverse	360°

b. 50-mm AA/AT Gun (5-cm Flak 41)

Little is yet known of this weapon, which was introduced in December 1940, except that it fires both HE and AP, is an automatic weapon, and is produced in either mobile or fixed models. The sight fitted is Flakvisier 41, which is operated by one man and is described as a completely automatic clockwork sight.

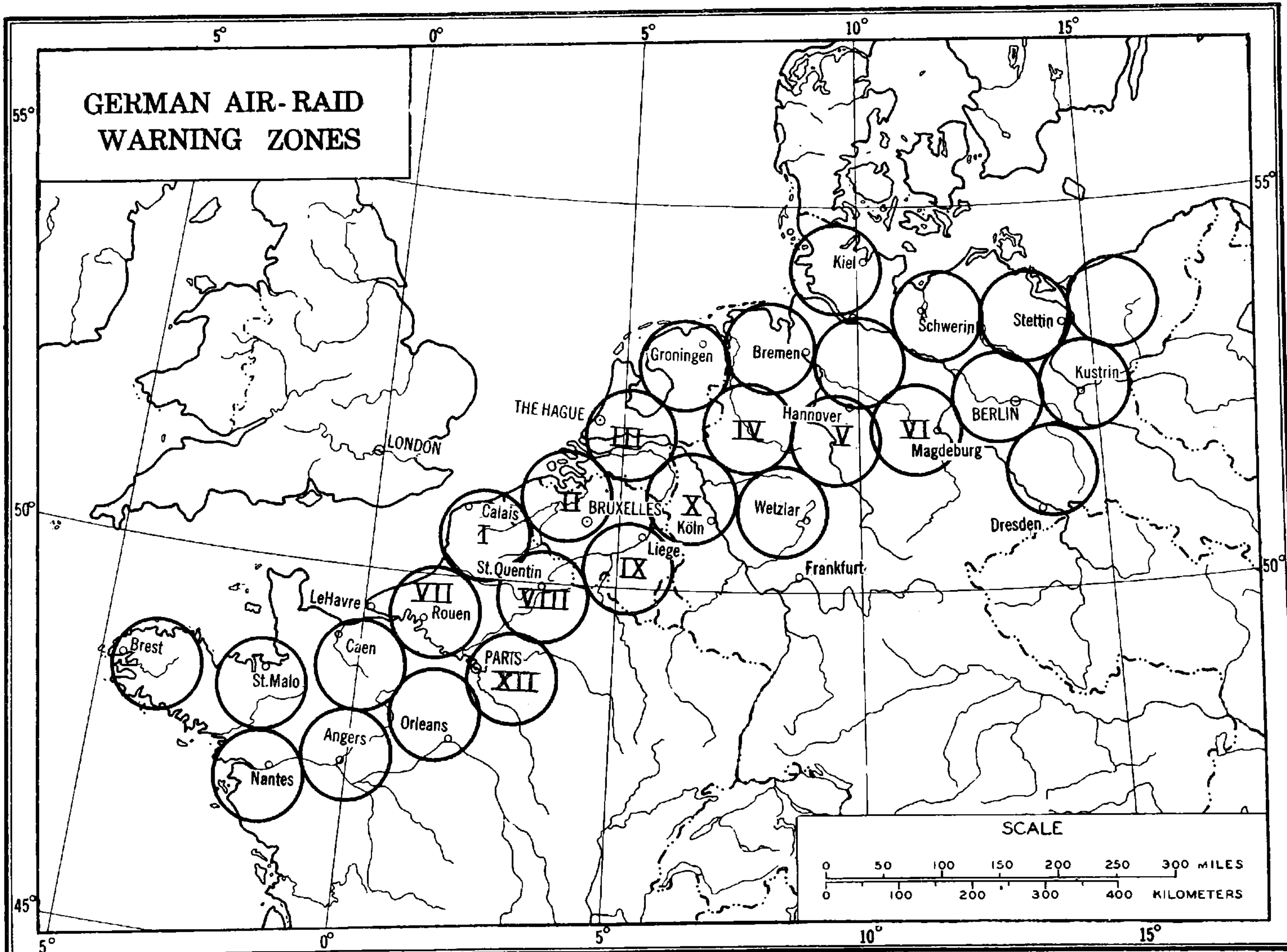
There is a possibility that this may be a tapered-bore gun, as the only two other German guns designated with the number '41' (the 2.8-cm Pak 41 and the 4.2-cm Pak 41) have been of the tapered-bore type.

c. 83.5-mm AA Gun (8.35-cm Flak 22 (t*))

This is a Skoda gun introduced into the Czech Army in 1922 as their standard semimobile heavy AA gun. Particulars are:

Muzzle velocity	2,625 f/s
Length of bore	55 cals
Max. horizontal range	19,650 yds
Max. vertical range	39,250 ft
Weight in traveling position	8.4 tons
Elevation	0° to $+90^{\circ}$

*Abbreviation for "tscheck," meaning Czech.


GERMAN AIR-RAID WARNING ZONES
LONDON
THE HAGUE
BRUXELLES
Calais
St. Quentin
LeHavre
Rouen
Caen
Brest
St. Malo
Nantes
Angers
Orleans
PARIS
Liege
Köln
Groningen
Bremen
Hannover
Kiel
Schwerin
Stettin
Kustrin
BERLIN
Magdeburg
Dresden
Wetzlar
Frankfurt
I
II
III
IV
V
VI
VII
VIII
IX
X
XII
SCALE
0 50 100 150 200 250 300 MILES
0 100 200 300 400 KILOMETERS

Traverse	360°
Weight of projectile (HE)	22.4 lbs
Tractor drawn.	

d. 105-mm AA Guns (10.5-cm Flak 38 and 39)

This gun is a standard heavy AA gun. It was originally designed as a dual-purpose antiaircraft-coast-defense gun. Experiments were made to produce the gun in a mobile form, and a limited number on mobile mounts appeared at Hitler's birthday parade in 1939. This mount was said to be unsatisfactory, and the gun was used as a fixed model only for a time. Recent reports indicate, however, that a new mobile mount has been provided, and it is reported likely that the Germans intend using the weapon in antitank role as they do the 88-mm gun. Particulars are:

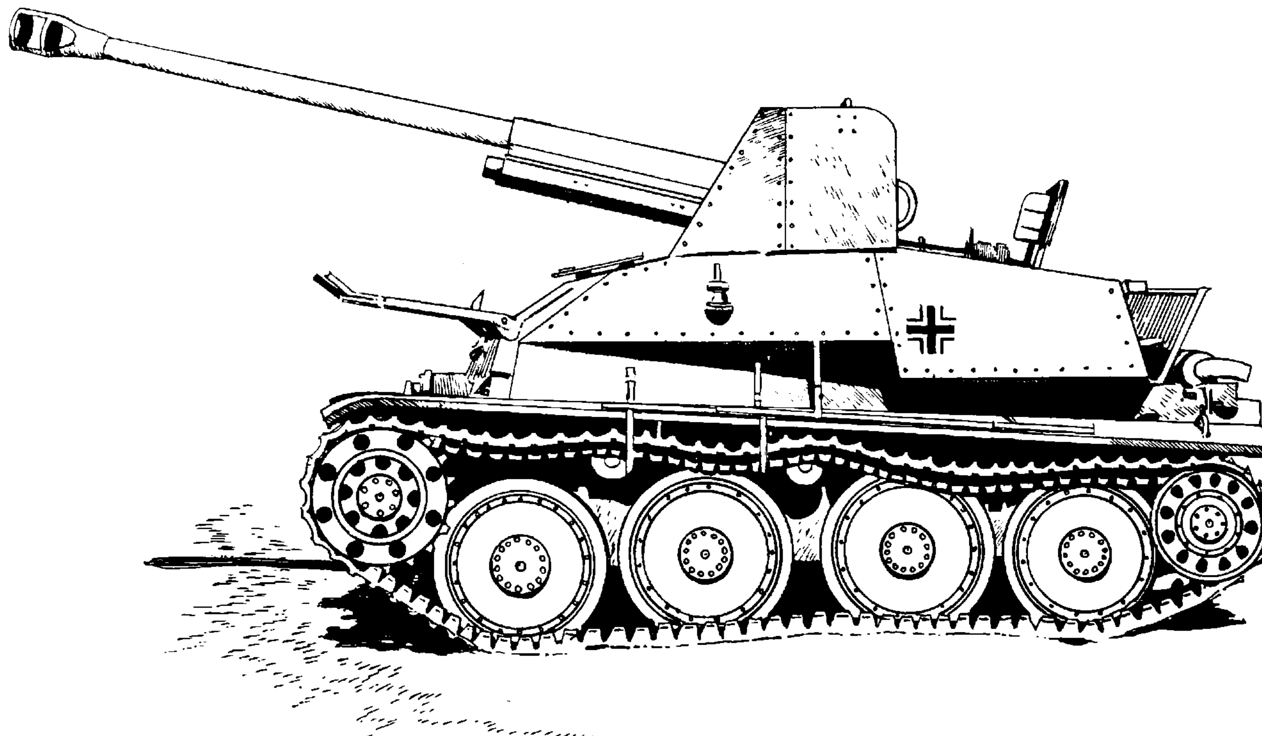
Muzzle velocity	2,890 f/s
Length of bore	60 cals
Max. horizontal range	19,075 yds
Effective ceiling	36,700 ft
Rate of fire (practical)	8 - 10 rpm
Weight in action	11.56 tons
Elevation	-3° to $+85^{\circ}$
Traverse	360°
Weight of projectile (HE)	33.2 lbs
Types of ammunition	HE with time fuze HE with percussion fuze AP shell

Tractor-drawn on a 4-wheeled carriage.

4. GERMAN 76.2-MM SELF-PROPELLED GUN

This weapon is another example of the German tendency to mount a large variety of guns on self-propelled mounts. These weapons have been in action in North Africa. The accompanying sketch is based on photographs of a captured specimen.

The weapon consists of a Russian 76.2-mm gun mounted on the Czech 38 (t) light tank chassis. The gun has a traverse of about 40 degrees, and an elevation of minus 5 degrees to plus 20 degrees. It is an adaptation of the standard Russian light field piece, which is reported to have a maximum range of about 15,000 yards and a muzzle velocity of about 2,300 to 3,400 feet per second; it fires a projectile weighing about 15 pounds.



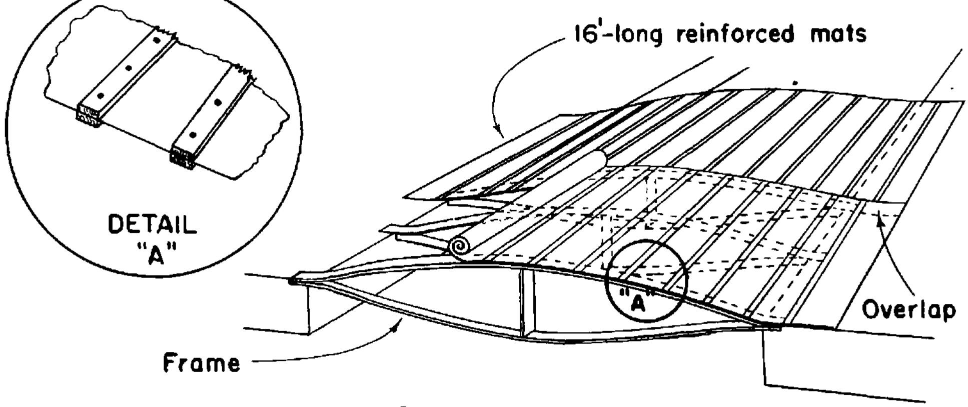
GERMAN 76.2-MM SELF-PROPELLED GUN

5. FINNISH TANK TRAPS OVER FROZEN RIVERS

A recent report on the method used by the Finns to open tank-trap channels in the ice over streams and lakes, and to keep them open and hidden, may be useful for purposes of winter operations. Briefly, the Finns saw out a channel in the ice, roof it over, leaving an air space underneath to prevent re-freezing, and replace the snow over the roof to keep the air space warm and to hide the trap.

The work is not difficult. After the outline of the trap has been traced, the snow over the ice to be cut is scraped back into windrows (as in fig. 1, stage 1). Then, a channel 13 feet wide is sawn out, with the cut on the down-stream side sloping outward and downward from the center, so that the ice cakes can be pushed down into the current and the channel is left clear, (stage 2). Over the cut is then laid a light framework roof with either a curved, or cigar-shaped cross section of the king-post type (stage 3), made of light material. The arch provides the air space over the water. Then the snow is shoveled back (stage 4).

FIG. 3



CONSTRUCTION OF MATS

The best time of year for trap making is early winter, while the ice is still thin, although there must be snow enough for insulation and concealment. Ice less than 8 inches thick will not support a roof. The mats which roof over the cut are made in 15- to 16-foot lengths, 4 to 5 feet wide and rolled for transportation (see fig. 3). They must be supported by frames, of which two types are shown in figure 2. Suitable materials for the mats are roofing felt, shingles, cloth of all sorts, and corrugated paper or stiff paper such as cement sacks. In a pinch, brush will probably do. To place the frames in position, the top of each

FIG. 1

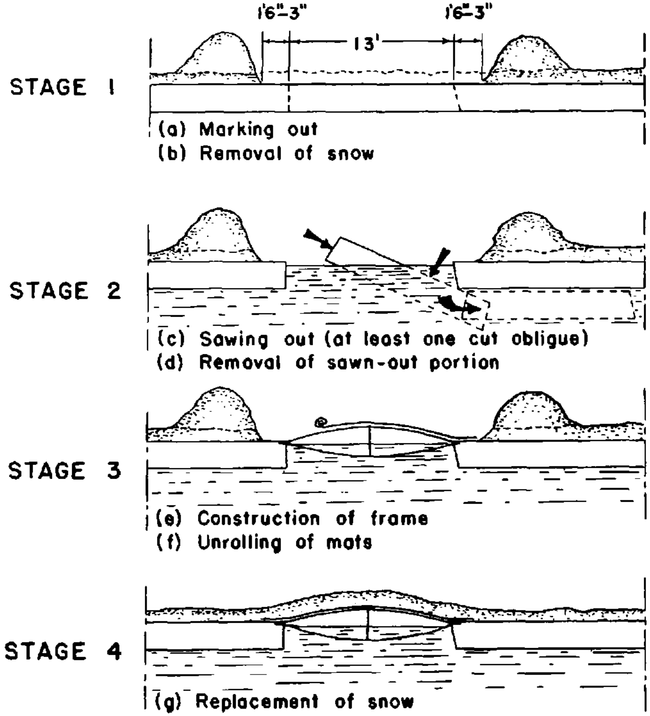
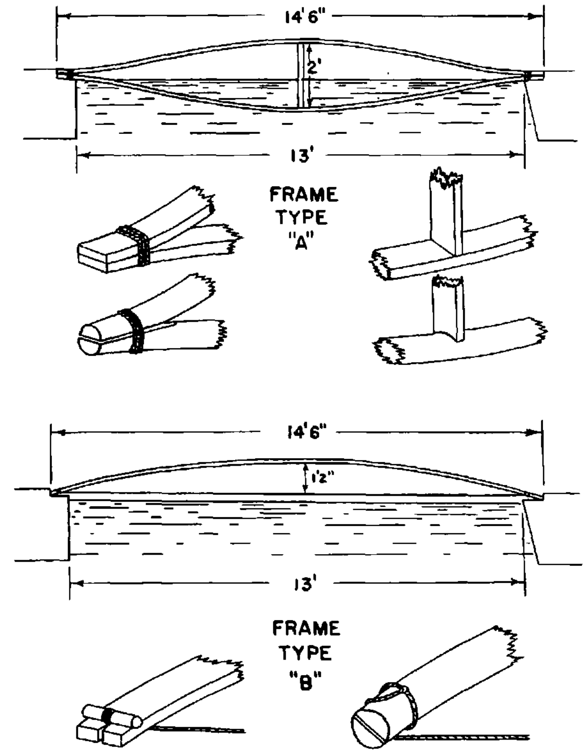


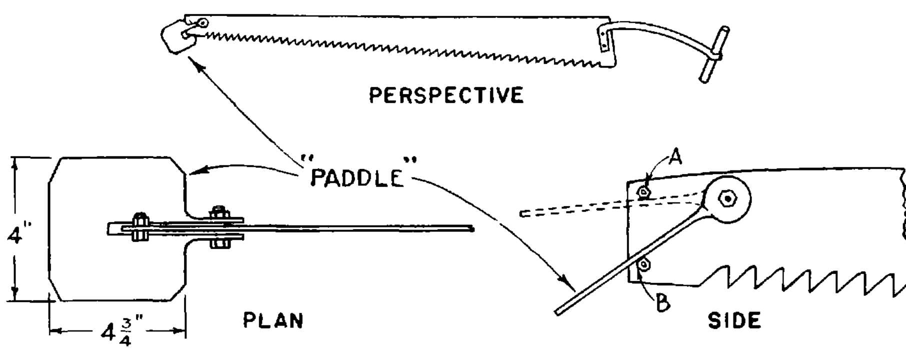
FIG. 2



FINNISH TANK TRAP ON ICE

ice bank is notched back a distance of from 9 inches to 2 feet, and the frames are set in the notches and packed with snow or chunks of ice. Their construction is shown in figure 2. In cold weather they freeze in place in a few minutes. These frames are set at intervals of from 1 foot 6 inches to 2 feet. The snow blanket over the mats should be at least 4 to 6 inches thick, and, if blown away, must immediately be replaced or the channel will quickly freeze.

FIG. 4



DETAILS OF ICE-SAW

The sawing is done with a saw of the design shown in figure 4. At its tip, the saw carries a hinged, paddle-shaped, steel plate which pivots up and down between stops (a) and (b). On the down-stroke, the paddle is forced down against lower stop (b), which serves to keep the blade firmly pressed against the ice, while on the up-stroke, the plate swings up out of the way against stop (a), in alignment with the motion of the saw, thus permitting easy withdrawal. The fitting of the "paddle" attachment should not be beyond the skill of a good army mechanic. The performance of the saw follows:

Ice Thickness (feet)	Ice Thickness (inches)	Cutting Speed (feet per hour)
1	0	130
1	8	80
2	4	50

The life of a trap depends on the weather and the care which goes into the making of the trap. Naturally, the degree of insulation against the freezing of the water underneath the mat varies with the thickness of the snow cover and with the water level; variations in either may increase or lessen the space. New ice (up to 4 inches) may be taken out with HE. Finnish experience shows that carefully made traps will remain effective against medium tanks for from 6 weeks to 2 months, up to midwinter.

ARMORED FORCE

6. PZ. KW. 3 WITH 75-MM GUN

Among enemy tanks recently examined in the Middle East was a Pz. Kw. 3 mounting a short-barreled 75-mm gun (7.5-cm KwK 38), identical with the short-barreled gun mounted on the Pz. Kw. 4.* The tank had been demolished, but it appeared that the only alteration, apart from the substitution of the 75-mm gun for the normal 50-mm gun, was the fitting of the armored barrel-sleeve into the front plate of the recoil mechanism belonging to the 75-mm. (Compare accompanying sketch with sketch of Pz. Kw. 3 armed with the long-barreled 50-mm gun, appearing in Tactical and Technical Trends, No. 20, p. 11.)

The German nomenclature for this tank is not known, but recently the Germans have referred to an Einheitspanzer. This is said to be a new standard tank combining the best features of both Pz. Kw. 3 and 4, and to consist of a Pz. Kw. 3 chassis with a short-barreled 75-mm gun mounted in the turret. If this is true, the tank examined may be an Einheitspanzer.

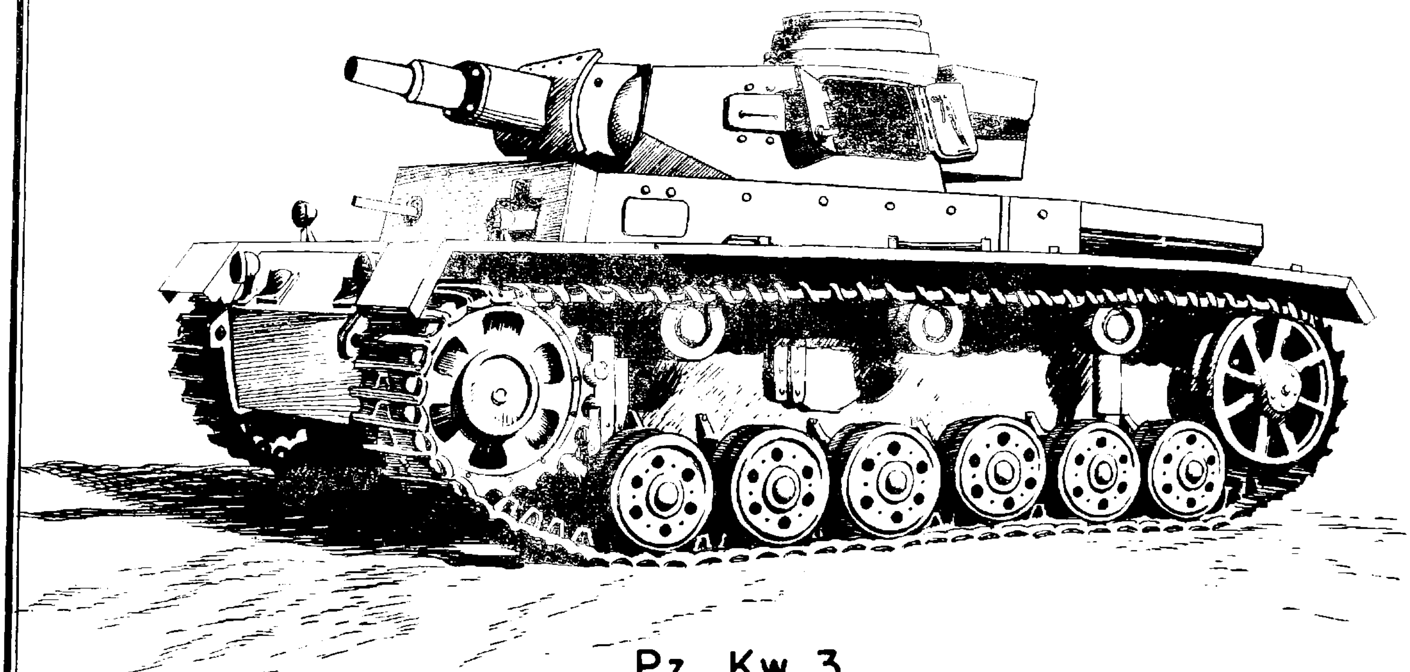
Another Pz. Kw. 3 with the short-barreled 75-mm gun has been captured in Tunisia. Presumably this is the same model tank as that examined in the Middle East.

CHEMICAL WARFARE

7. THREE JAPANESE LACRIMATORY WEAPONS

The Japanese have at least two types of lacrimatory candles, and at least one type of lacrimatory grenade. The agent employed in all three is CN (chloracetophenone), a tear gas.

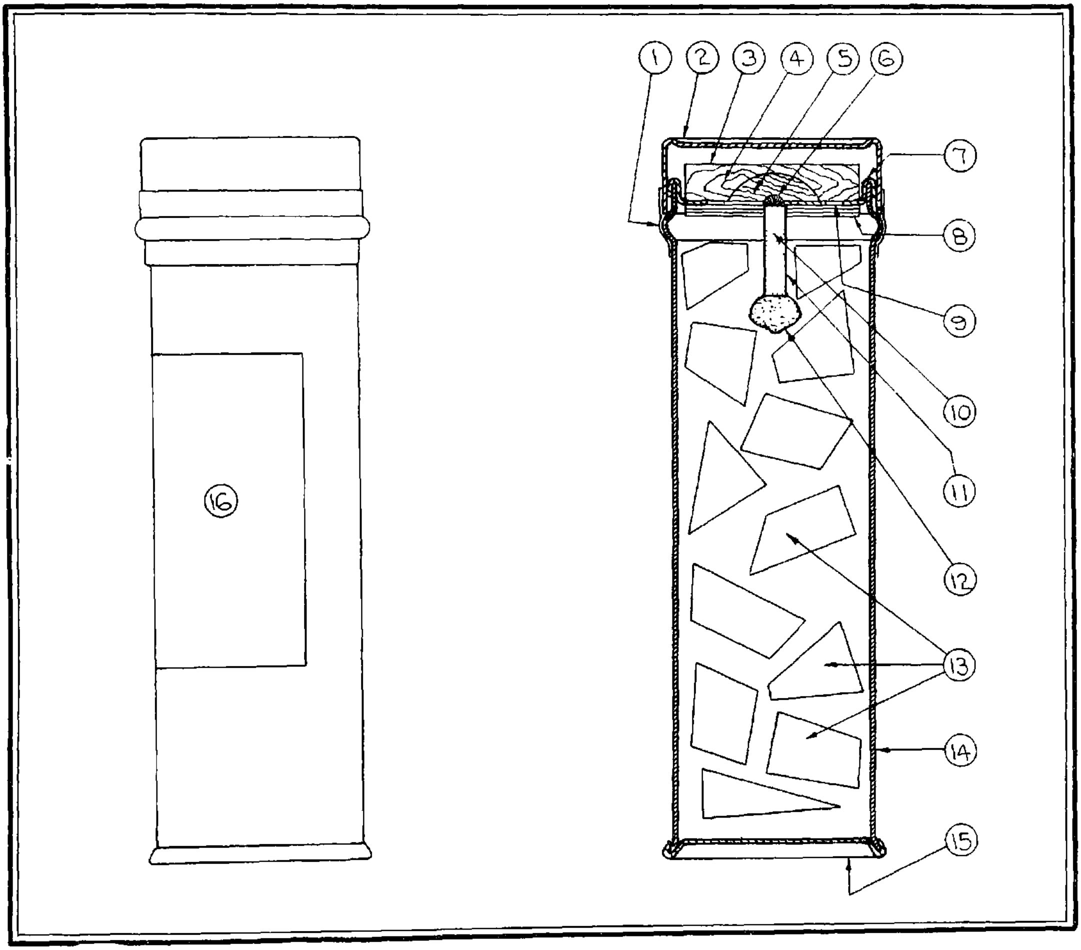
*Recently Pz. Kw. 4's with a long-barreled 75-mm gun have been encountered by Allied forces (see Tactical and Technical Trends, No. 20, p. 10).



Pz. Kw. 3
WITH 75-MM GUN

a. Lacrimatory Candle, Type "89"

This lacrimatory candle, 7 1/16 inches in length, weighs approximately 8.5 ounces, including the chemical filling weighing 4.6 ounces. The lacrimatory filling consists of collodion flakes impregnated with 25 percent CN. The container is painted a greenish-gray color.



Key to Sketch

1. Adhesive tape
2. Lid (metal)
3. Abrasive surface
4. Scratch block (wood)
5. Cotton wad
6. Match head
7. Inner cover
8. Gauze
9. Vents
10. Fuse
11. Fuse tube (copper)
12. Starter mixture
13. Impregnated flakes
14. Container
15. Base
16. Label

The label had the following printed instructions:

(1) Uses

(a) On maneuvers, to represent non-persistent gas;
(b) For dispersing crowds, riots, etc.

(2) Method of Using

(a) Tear off the waterproof adhesive tape (1) and remove the lid (2);
(b) Take out the scratch block (4) and rub it on the top of the match head (6); after ignition, place the candle in position or throw it;
(c) Gas is emitted 4 seconds after ignition.

(3) Special Caution

(a) Before ignition, put on gas mask; the gas vents (9) must face away from the body;
(b) Do not use the candle near inflammable substances;
(c) After all gas has been emitted, do not touch the candle for several minutes, because of the heat generated;
(d) If the chemical comes into contact with the skin, use soap and water (warm water alone will also do) as soon as possible.

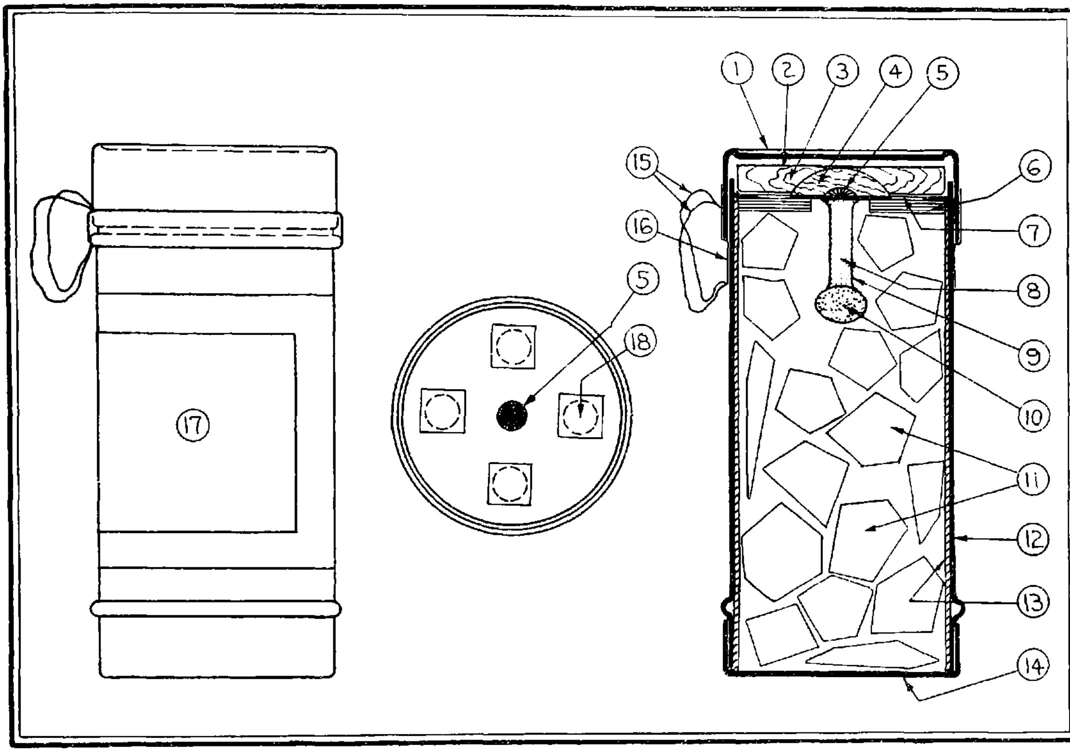
(4) Effective Life

One year after manufacture; thereafter, to be examined for effectiveness every 6 months.

b. Green Lacrimatory Candle, Type "A"

The total weight of this candle is 5.9 ounces, including the chemical filling which weighs 1.9 ounces. It is 2.3 inches in diameter and 5.2 inches in length. The lacrimatory filling consists of collodion flakes impregnated with CN.

The label on this candle is essentially the same as the one under paragraph a. above, except that the period of effective life is six months after the date of manufacture.



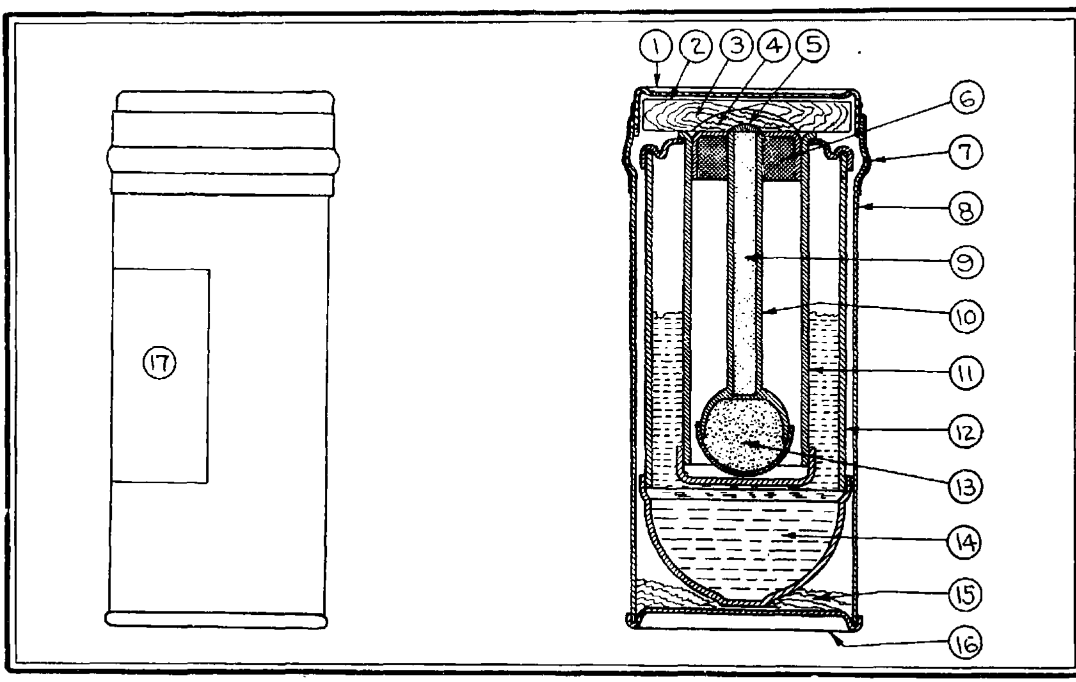
Key to Sketch

1. Lid (metal)
2. Abrasive surface
3. Scratch block (wood)
4. Cotton wad
5. Match head
6. Three layers of gauze
7. Vents
8. Fuse
9. Fuse tube (brass)
10. Starter mixture
11. Impregnated flakes
12. Outer container
13. Inner container (cardboard)
14. Base
15. Cord for removing tape
16. Adhesive tape
17. Label
18. Vents (sealed with oil paper or tinfoil)

c. Lacrimatory Grenade, Type "89," Type "C"

The total weight of this grenade is approximately 11 ounces, including the lacrimatory filling which weighs 4.84 ounces. It is 2.1 inches in diameter and 5.1 inches long. The label (17) on the body gives the details of its use and method of operation. It is painted a silver-gray color.

When the grenade is removed from the outer container (8), a match head (5) forming the top of the fuse (9) is exposed. This is ignited with the abrasive surface (2) of the scratch block (3) and after a delay of 4 to 5 seconds the burster charge (13) becomes ignited. On exploding, the grenade is shattered and the lacrimatory filling (14) scattered. The lacrimatory filling is CN dissolved in carbon tetrachloride. The container for the fuse (10), the insulating tube (11), and the container for the lacrimatory (12) may be vulcanite, celluloid, or some plastic material which would not be corroded by the liquid filling.



Key to Sketch

1. Lid (metal)
2. Abrasive surface
3. Scratch block (wood)
4. Cotton wad
5. Match head
6. Cement stopper
7. Adhesive tape
8. Outer container (metal)
9. Fuse
10. Container for fuse
11. Insulating tube
12. Container for lacrimatory
13. Burster (gun powder)
14. Liquid lacrimator
15. Cotton packing
16. Base
17. Label

ENGINEERS

8. JAPANESE FIELD WORKS AT BUNA

The taking of the Japanese positions in the Buna area (southeastern New Guinea) was a relatively lengthy process. Much of the difficulty was occasioned by the strong field works constructed by the enemy, and by the tenacity with which these works were held. Of interest, therefore, is the following extract from a report made by a U.S. Army engineer.

*   *   *

The enemy bunkers and dugouts in the Buna area were constructed of cocoanut-palm logs, dirt, sand, and sand bags, covered with natural camouflage. In some instances, pieces of armor plate were set up. No concrete positions were found. The log-and-dirt bunker construction was done carefully and strongly. The corner posts were firmly embedded in the ground, and the horizontal logs neatly and strongly attached and interwoven. Several alternating layers of logs and earth were generally used to give full protection against mortars and light artillery. Roofs were thick and were also made of alternating layers, giving excellent protection. Bunkers were connected to systems of radiating fire and communication trenches on both sides. In some instances, underground trenches were used, and the enemy used these to place snipers in our midst even after they had long been driven from the general area. Leaves and grass were well used to camouflage all bunkers; in addition, the bunkers had been planned and built for just this purpose long before the campaign actually started, and the quick jungle growth, sprouting up over the earthworks, gave first-class natural camouflage.

The enemy work was generally neat and strong. One position in Buna Mission, consisting of kitchens, latrines, dugouts, and trenches, was, in consideration of the locale and the terrific bombardment that it had endured, a model of neatness and efficiency.

The enemy dugout positions were well sited and mutally supporting. It was extremely difficult, if not impossible, to bypass any of the positions, each of which had to be reduced in turn.

It would be impossible to overstress the tenacity with which the Japs clung to their prepared positions. Grenades, and ordinary gun and mortar fire were completely ineffective. There were many instances (not isolated ones) where dugouts were grenaded <u>inside</u>, covered with gasoline and burned, and then sealed with dirt and sand,--only to yield, 2 or 3 days later, Japs who came out fighting. One souvenir hunter, entering, 4 days after the battle, a dugout that had been sealed, was chased out by a Japanese officer wielding a sword. Some of the instances in which Japs lived on in these positions, through the burning and the detonation, in the filth and gore, when sorely wounded themselves, are almost incredible.

INFANTRY

9. JAPANESE RUSES--BUNA AREA

The extensive use of deception and ruses by the Japanese is well known. Below are described two which were used in the Buna area (Southeastern New Guinea).

a. "Dummy" Snipers

An American patrol advancing up the coast was fired on by a sniper in a tree. They halted, located him, and apparently shot him down. They then advanced and were fired on again. This happened several times. Thorough investigation revealed that one sniper had been holding up the patrol, and dummies had been placed in other trees. After the Americans had fired sufficient shots, these dummies were dropped by a pulley arrangement. This caused the Americans to suppose that they had cleared the opposition.

In another case, the sniper's dummy was rigged so that it could be pulled back up into place; the sniper made the mistake of pulling it back up too soon, giving away his ruse.

b. "Short" Rounds

The morale and spirit of an Allied unit advancing under covering fire of friendly artillery was seriously affected by this ruse. Every time our guns opened up to provide covering fire for an advance, or fired on any target, the one known Jap 70-mm gun in the Government Gardens area also opened up and placed its rounds among our forward elements. The Japanese timed the activity of their own gun to coincide exactly with that of our supporting artillery. This made the troops imagine that they were being fired on by their own guns.

10. JAPANESE TACTICS ON GUADALCANAL

The following miscellaneous observations on Japanese tactics on Guadalcanal were made by a U.S. Marine colonel, commander of one of the Marine regiments.

* * *

The Jap has been taught that he is invincible. He is accustomed to having the enemy run when Japanese elements get around their enemy's flanks and rear. He is also accustomed to the enemy running when he charges with the bayonet. In his night attacks, he expects the enemy to be caught in front of or on the tactical objective (always an identifiable terrain or other feature) and to be defeated; thus, the mission of his night operations is accomplished.

Consequently he has been upset, confused, and defeated by American troops who do not run, who themselves charge with the bayonet, and who are not

where they are expected to be in night attacks--instead, they counterattack when the Japanese are confused and in process of reorganizing after having reached their night-attack objective.

In night attacks the Japanese would send advance parties by the valleys through the denser cover, reserving the more open terrain of the higher ground for the main body and main effort. They would have the main body make considerable noise in order to drown out any noise the advance parties might make. The Jap has had the advance parties clear away jungle growth along avenues of subsequent approach for larger units, and has "blazed" the trails thus cleared with luminous paint. The Jap moves his main forces up in closed-up columns--partly for reasons of command control.

For purposes of control and orientation, Japanese night attacks followed clearly defined terrain features, e.g., a crest ridge-line or a stream. The Japanese selected night-attack objectives from observation of our dispositions at sunset. If he later fails to find these dispositions where he expects them, he becomes confused in the dark and does not know where to look for us. It would take him an hour or two to get reorganized, and that was the time to counterattack him. Heavy casualties were inflicted on him then.

On Tulagi, the Jap took up his positions on the reverse slopes. This gave him better visibility up against the crests and sky, and permitted intense surprise fire of devastating effect at short ranges. However, when he counterattacked at night out of these positions, he suffered so many casualties that he did not have men enough to hold his reverse-slope positions the next day.

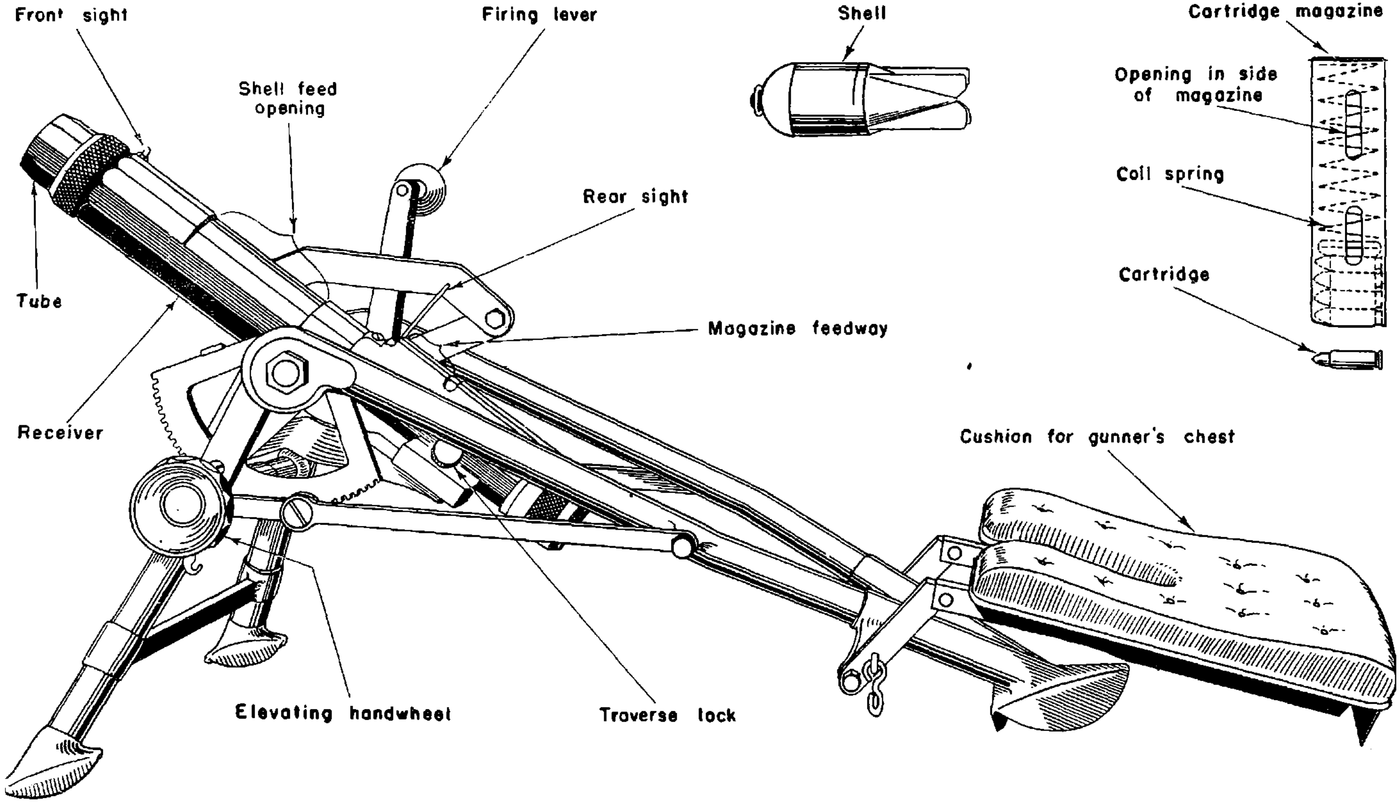
The Japanese machine-gun dugouts were held in strengths of 10 to 12 men. When one man was killed, another stepped up and manned the gun. This required every man to be killed, and so the positions held out for hours. Immediately the Jap discovers a machine gun, he will send over mortar bombs, usually within 10 minutes. The Jap digs in wherever he stops. In a few minutes he will have a slit trench, and in 20 minutes a man-deep foxhole.

ORDNANCE

11. ITALIAN 45-MM MORTAR

Examination of this equipment has identified it as the standard Italian 45-mm light mortar, model 35, Brixia.

The mortar is a breech-loaded, trigger-fired weapon. The shell is a short-finned projectile weighing about 1 pound. It is propelled by cartridges fed from a detachable box magazine fitted on top of the receiver. The shells are loaded singly by hand. As will be noted in the accompanying sketch, the mortar is mounted on a folding tripod, with a padded frame hinged to its rear leg. It is known that the weapon has been used in both the African and Russian campaigns.



ITALIAN 45 MM-MORTAR

The weapon is of very elaborate design, and would probably be very costly to manufacture even in mass production. Because of the complicated mechanism of the mortar, it would be subject to malfunctions and improper operation. It is reported as having a high rate of fire, is steady in action, and folds conveniently for carrying. It is understood that the mortar shell has very poor fragmentation.

a. Characteristics

The general characteristics are:

Caliber	45 mm (1.77 in)
Weight (complete with tripod)	35 lbs
Reported range (maximum)	585 yds
Reported range (minimum)	350 yds
Maximum capacity	10 cartridges
Weight of shell	1 lb

b. Description

This mortar is a smooth-bore, breech-loading, trigger-operated weapon and can be fired at elevations below and above 45°. The shell is hand-loaded, and propelled by a cartridge (clip fed) from a chamber located on top of the receiver. Only one charge is used, but the range may be increased or decreased by closing or opening the ports located under the barrel. Elevation must also be taken into consideration.

The mounting is a folding tripod, with a padded seat or frame hinged to its rear leg. When the mortar is in firing position, this padded frame acts as a cushion for the firer's chest, and when folded in transport it eases the load on his back.

c. Ammunition

The HE shell weighs about 1 pound. The body is constructed of a mild steel with an aluminum tail. The tail is painted to indicate the type of shell. Red is the marking for HE shells. It is reported that practice shells are painted yellow, and instructional ones are unpainted.

The shell examined is fitted with a safety cap held in position by a safety strip. This is to provide safety during handling and transport, and must be removed before loading the mortar.

On setback, the setback locking pin drops to the rear, freeing the arming vane. As the shell is propelled through the air, it is armed by the rotation of the arming vane. On impact, the firing pin contacts the primer, which in turn sets off the booster of Petn (penta-crythritol-tetranitrate) and lead styphenate, and finally the bursting charge of TNT. Located inside the body of the shell is a coil of spring steel. This gives added fragmentation to the shell when it is

finally detonated.

The propelling cartridge is constructed of brass and has a mouth crimped into a six-point star.

The primer mixture was the corrosive type, containing mercury fulminate, antimony trisulfide, potassium chlorate, and ground glass. The mixture was covered with a thin film of lacquer.

The powder charge was of the double-base type, and was tamped into place with a ball of cotton wadding. Its probable function is to secure the charge during the necking and crimping operations, as well as to provide a more effective seal for the powder than the crimping does.

12. SOME NOTES ON GERMAN WEAPON DEVELOPMENT

a. General

The goal of all modern armies is the maximum production of good and efficient weapons in a minimum variety of types. The advantages of limiting weapon types to the smallest number consistent with effective warmaking have been shown to be numerous. If weapon designs are highly standardized and relatively few in number, equipment can be produced swiftly and abundantly by mass-production methods. Further, the training of troops is simplified and facilitated, and if the weapons themselves can be used in interchangeable roles (the dual-purpose AA/AT guns are a familiar example), battle efficiency is greatly increased.

Nazi Germany has been most consistently and successfully devoted to the principle of limiting the variety of weapons to the smallest number which will give the required combat strength and effectiveness.

Since the original basic designs upon which the equipment of the present German army was produced, there has been no pause in the intensity of development which followed. As the German army gained experience, newer and more efficient designs of equipment were produced, and existing types were modified as circumstances required. German designers learned their lessons rapidly, and the result is that even standardization carried on to an extreme, as it undoubtedly is in German equipment, has little or no effect upon the development of better and more efficient weapons. Italy has tried hard to conform with the rapidly changing requirements which the present war has brought about, but, hampered by a chronic lack of adequate designers, adequate raw materials, and adequate facilities, she is always just one step - and sometimes just one hundred steps - behind. There has been much for Italy to learn since Italy felt the full weight of modern armaments, and, with an increasing German influence in control, the Italian armament industry is at least making an effort not to be left too far behind. Evidence from many sources, obtained during or immediately prior

to present operations, makes it possible to collate what is known about certain new equipment, and makes it possible to draw some conclusions. The following is a partial list of certain enemy equipment identified in the course of recent operations.

b. German Kampfpistole

The Kampfpistole itself is the normal, light-metal signal pistol, slightly bored out and rifled, and has a caliber of 27 mm. The only projectile so far identified is an HE grenade with a direct-action fuze operating on impact. The accurate range is very short, and the maximum range is not more than about 100 to 150 yards. There is little effective fragmentation, and the effect is only to project an "offensive"-type grenade a little further than it could be thrown by hand.

c. Rifle Grenades

(1) Grenade Launcher (Schiessbecher)

This is a heavy-metal grenade launcher in two parts, having a caliber of 30 mm. The main body can be clamped to the muzzle of any rifle model 98 (except Models 98a and 98/40) and carbine model 98K. The clamp itself fits just behind the front sight. Into this component is screwed a cylinder forming the rifled bore of the cup. The rifled cylinder is the male portion and has a very rapid right-hand thread. A special tool is supplied with each cup for assembling.

(2) Grenade Launcher Sight (Granatvisier)

The sight is a simple attachment clamped to the left-hand side of the rifle just to the rear of the rear sight and comprising a "U" notch rear sight and blade front sight, on a base revolving about an axis and aligned by a small spirit level. There are two range scales, reading respectively from 0 to 250 meters for low-angle fire, and 250 to 50 meters for high-angle fire. The graduations apply to the HE round only; when firing the AP round, 75 meters on the low-angle scale correspond to a range of 100 meters, and 50 to a range of 65 meters.

(3) HE Grenade (Gewehr Sprenggranate, or G.Sprgr.)

The projectile consists of a blackened steel body with an aluminum nose fuze and a grooved collar fitting into the rifling of the grenade launcher cup. The fuze operates on impact, but the shock of discharge also initiates a delay system in the base which, in the event of the nose fuze failing to function, detonates the explosive filling after a delay of 5 seconds. The collar carrying the rifling may be unscrewed from the body and the igniter string pulled, in which case the projectile can then be thrown as a hand grenade, operating after 4 1/2 seconds. The effect is equivalent to that of a "defensive" type of grenade, the radius of fragmentation being given as about 30 yards.

(4) AP Grenade (Gewehr Panzergranate, or G.Pzgr.)

This is a form of armor-piercing rifle grenade. It incorporates the hollow-charge principle. In appearance the grenade is a long cylinder, partly steel and partly aluminum, with a black, rounded-metal nose cap and a base plate slotted to facilitate removal. The forward half of the cylinder is constructed of steel and contains the bursting charge, a light metal diaphragm shaping the hollow charge. The rear aluminum half of the cylinder, which carries an interrupted collar with 8 right-hand grooves to fit the rifling of the launcher cup, contains a fuze and explosive train. The weight of the bursting charge is exceedingly small compared with the total weight of the grenade, and the general design is unnecessarily complicated, with considerable waste of efficiency. There is no provision for use as a hand grenade.

(5) Practice Grenade (Gewehr Sprenggranate Ub.)

This round is fitted with a smoke generator, 6 holes for smoke emission being drilled in the side of the body.

(6) Cartridge and Packing

Each grenade is packed with a bulletless, blank rifle cartridge in a cardboard container, which may be marked with the German nomenclature. The cartridges are not interchangeable between rounds of different types. The containers are black with a white spot on the end for AP rounds, and gray for HE rounds.

(7) Range

HE - Maximum range 250 yards (approx).

AP - Moving targets are to be engaged at ranges of less than 100 yards, the vulnerable parts of tanks being penetrated, according to an enthusiastic but probably over-confident handbook, at ranges of under 50 yards. The latter range probably represents the degree of accuracy of aim, since the actual effect is not dependent upon range.

d. 200-mm Spigot Mortar

An effective introduction is the 200-mm spigot mortar (see *Tactical and Technical Trends*, No. 16, p. 32). Although intended for the destruction of obstacles, minefields, and gun emplacements, it is not considered that the effect would be sufficiently great to mark an advance in minefield clearance methods. The probable appearance of the projectile is an egg-shaped body containing the bursting charge, with a long tubular tail having fins at the base. The tail probably breaks off in one piece on detonation of the round, and there will be considerable blast effect with comparatively little fragmentation. It is possible that incendiary, smoke, and other chemical agents may be used.

e. Small Arms

(1) Pistol P.38

Although not a very new design, this pistol, which incorporates good design points of many previous types of pistol, is gradually replacing existing models.

(2) Machine Guns

A new model, the MG 41, is reported to exist. A still newer model, MG 42, exists and is more satisfactory than the MG 41 (see Tactical and Technical Trends, No. 20, p. 28).

The newer types differ from the MG 34 in having an increased rate of fire, and being lighter in weight. An increase in the rate of fire of ground MGs over the MG 34 (cyclic rate 900 rpm) is likely to prove of doubtful value, since the increased expenditure of ammunition will present difficulties without obtaining any real advantage.

(3) 20-mm Flak 38

This weapon is a development from, and an improvement upon, the 20-mm Flak 30 which has proved quite successful. It does not represent any radical change in design, but is simpler, more accurate in operation, and incorporates many minor improvements.

(4) 20-mm Flakvierling

This equipment consists of four 20-mm Flak 38s on a single, highly mobile carriage. Although probably intended for AA use, it can be used against ground targets and is a very useful marine equipment.

f. Hollow-Charge Ammunition

For reference to the use of German hollow-charge ammunition, see Tactical and Technical Trends, No. 19, p. 27.

g. Rocket Weapons

See Tactical and Technical Trends, No. 18, p. 26.

13. AXIS USE OF DIESEL OIL FOR ANTI-FREEZE

At temperatures running to 30 degrees below zero F. and lower, glycerine-water and glycol-water mixtures are useless as anti-freeze agents. Although two other agents, methanol and ethanol, have too low a boiling point and evaporate quickly, Axis forces reportedly used ethanol-water mixtures on the eastern front last winter.

It has been reported that the German Army, as a result of satisfactory experiments, used diesel oil as a coolant last winter. Since this oil has a lower coefficient of heat conductivity than water, the operating temperature of the engine will be raised--an advantage in extreme cold weather. While the oil is destructive to natural rubber joints, synthetic rubber is immune. Troubles may arise from corrosion, particularly in the radiator, because of a growth of acidity in the oil. At first the oil may be commercially pure, but the addition of moisture and dirt, together with the churning of the water pump, may crack the oil until acids accumulate to a harmful extent. Rust from the cylinder jacket may be present and, together with the emulsified oil, cause trouble. Such acids may attack copper and aluminum. The rising viscosity of the oil may cause mechanical troubles such as pump-shaft shearing or vane breaking.

14. GAS AND OIL IN GERMAN MECHANIZED VEHICLES

Certain data about the German use of fuel and lubricants for their mechanized equipment are reported as a result of the examination of specimens.

a. Gasoline

Analysis of German yellow gasoline shows that this normally has an octane number of 74 (similar to our "regular" as sold in American service stations) or better. The chemical composition of German gasoline varies considerably. It frequently contains a rather high proportion of benzol or of alcohol, and this should result in a slightly higher consumption per mile than with our regular 72 to 75 octane gasoline.

Specimens have shown cases which might cause difficulties in starting in cold weather, owing to lack of front-end volatility (low boiling-point fractions), but, in general, this yellow gasoline should be usable in all automotive equipment which has an octane requirement of 75 or less.

Gasoline containing alcohol is deleteriously affected by even small quantities of water mixed with it.

b. Lubricating Oils from a German Pz Kw 3

(1) Engine Oil

This has a high viscosity-index (95) and a low pour-point (below 0° F). It is intermediate between SAE 30 and SAE 40 in viscosity grade, but rather nearer to the latter.

(2) Gear Box Oil

This is probably a straight mineral-oil product with an original viscosity approximating that of an SAE 140 gear lubricant.

c. Final Drive Oil

This is probably a compounded lubricant, of viscosity grade similar to Hypoid 90 with a pour-point below 0° F.

d. Shock-Absorber Fluid

This is a straight mineral-oil product of rather lower quality than normal light, non-freezing, mineral oil of low viscosity, but within the limits of the specification of this oil as regards specific gravity and viscosity index.

GENERAL

15. FOOD AVAILABLE IN THE JUNGLE

In Tactical and Technical Trends, No. 19, p. 49 some of the "dangers" of the Tropics were pointed up to show that, to a large extent, they were over-emphasized, or their true significance distorted.

The following report of an American Army officer is intended to show the possibilities of "living off the land" in the jungle and to describe the customs of the natives in preparing meals made up of the various types of food locally available. The experiences recounted are the result of a 4-day experimental reconnaissance.

* * *

Eight noncommissioned officers of the 1st Battalion and myself accompanied two French officers and two platoons of the New Hebrides Defense Forces (native troops), on a 4-day reconnaissance trip up the Teouma River. The primary purpose of the trip was to see if it were possible for 75 to 100 men to live off the land indefinitely in the jungles of this island.

Although 3 days' rations were carried by each man, very little was touched except tea and biscuits. It was conclusively proved to my satisfaction that men who are resourceful and who will take the time to learn a little jungle lore can easily live and thrive healthfully in these jungles all about us.

a. Types of Food

To list by group all the various foods we found in the jungle:

Meats

Wild chicken
Wild duck
Wild pigeon
Wild cattle
Wild pig
Flying fox
Fish (mullet)
Eel
Fresh water crawfish (prawn)

Vegetables (all year round)

Taro
Yam
Manioc
Hearts of palm trees
Hearts of pandamus

Fruits

Bananas (all year round)
Oranges (May, June, July)
Tangerines (May, June, July)
Lemons (May, June, July)
Bread fruit (February, March)
Wild raspberries (September, October)
Nakarika (October, November)
Papaya (all year round)
Mangoes (October, February)

Nuts

Coconut (all year round)
Navele (September, October)

Water vine

b. Poisonous Vegetation

We learned that there were seven varieties of nangalat, a poisonous leaf that upon contact with human flesh produces an instantaneous burning sensation and itching that lasts usually about 1 week. The native remedy is to rub immediately the juice from the stem of the poisonous nangalat (the same one that touched you) on the affected part. The worst variety of nangalat can be recognized by the red veins running all through the leaves and by the escalloped edges of the leaves. There is also a poison tree called the "goudron," which is easily distinguished by its coal black sap which invariably runs profusely down some part of the trunk. If you sleep under this tree, you will be taken sick and suffer with a severe headache lasting a long time. If you cut into the tree or in any way contact the "black blood" (as the natives call it), you may get a severe poisoning which puffs up the skin of the face and hands with a very dangerous and painful rash. Once subjected to this poisoning, one need only approach within 50 feet of a "goudron" tree to get the same poisoning all over again. Some people have been known to have been so severely poisoned that they never were completely well again.

c. Lumber Products

We learned that the bark of the rotin (rattan) tree (the wood that all the fences around us are made of) makes a rope of any desired size. It is practically impossible to break even a fine thread of it. The bourrée tree is also excellent for this purpose.

We learned to recognize several very hard woods that are excellent for building anything you wish to last for a long time.

There is a very common bush all about us from which is extracted ricin oil; it is used to produce a high-grade aviation oil.

d. Methods of Cooking

An interesting thing was to see how the native troops cooked the fish, prawn (crawfish), and meat that we ate. There were two methods used in cooking the fish. The first method was to clean and scale the fish and then wrap them up in wild banana leaves. The bundle was then tied securely with rotin-bark twine, placed on a hastily constructed wood griddle, and roasted thoroughly until done. The second method was to wrap up the fish in the same manner, and then place the bundle well down inside and underneath a pile of stones which had been heated in advance until they were red hot.

The crawfish were dumped alive into a hollow section of bamboo about 2 feet long and thus roasted over the open fire. The bamboo chars, but does not burn through. They were very delicious. Meat was cut into small chunks and packed down into this same type of bamboo roasting stick. Meat cooked this way would last from 3 to 4 days without spoiling, if left inside the bamboo stick with the ends sealed. The meat for immediate consumption was cut into steaks and

roasted on sticks much as we would roast "hot dogs."

Yam, taro, manioc, and wild bananas were cooked in the coals, and tasted not unlike potatoes if you stretched your imagination a little. Hearts of palm made a refreshing salad, and papaya a delicious desert.

All the wild meat was gamey, and generally a little tough. However, it tasted mighty good after a long march.

e. Methods of Fishing

The natives used two methods of fishing. If a large quantity of fish is desired, they seek out a good deep pool where fish are in considerable numbers, and toss in a hand grenade. This usually yields anywhere from 20 to 60 fish. The largest were about 15 inches long. If a few fish were desired, the natives would scrape a little bark from a navele tree, wrap it up in a leaf, and, wading with the leaf in one hand and a machete in another, drop it over a pool of fish or even a single fish. The curious fish would swim up to the leaf, and, when they did, the juice from the bark of the navele tree would knock them "groggy," and they would float up to the surface in a daze, easy prey for a machete.

f. Shelter

The natives would construct a combination bed and shelter against the rain in about 15 minutes. The bed was built about 3 feet above the ground by laying stout but pliable reeds over a framework supported by forked stakes. Several layers of large, fine ferns were then put on, thus forming a very comfortable bed. Another series of longer, forked stakes were placed alongside the short ones to support a roof about 6 feet above the ground. The roof was constructed in the same manner as the bed.

g. Water Rope

The natives showed us what they called a water rope. It is a vine, and when cut each foot yields about a teacup full of water. They would deftly cut off a 2-foot length and, holding it up, let the fresh water run into their mouths.

h. General Description of the Country

The country was very rugged. After the first day we were forced to wade practically all the time, as the river banks were either too rugged and steep to climb readily, or the jungle so thick as to make it practically impossible to continue without first cutting a trail. The river banks were so steep, and the foliage so dense, that observation was very limited during the whole trip. However, an unnamed mountain west of the Teouma River was a prominent landmark and could be seen intermittently. We passed it the last day, going about 2 miles beyond it up the Teouma. The last of our trip, I took a French noncommissioned officer and three natives with me. We disrobed; half swimming and half wading, we went a mile above the last fordable part of the stream. On this venture, in one

case we swam between a narrow gorge 10 or 12 feet wide with sheer, black, rocky walls towering 100 feet straight up over our heads. The natives told us that about 8 to 10 miles further upstream we would come upon a 100-foot waterfall, and several small ones, coming down from the summit of Mount McDonald.

In order to get any military information about the topography of the jungle we traversed, it would be necessary to cut a trail up to the ridge leading directly to Mount McDonald, the highest point on the island. The French officers knew the jungle as well as the natives, and they were most helpful and cooperative throughout the entire trip.

The purpose of the trip from the point of view of the native troops was to harden them. We marched in the mornings and hunted, fished, built camp, and made minor reconnaissances in the afternoons. We covered about 8 to 10 miles each morning, carrying about a 40-pound pack, including weight of weapon and ammunition.

16. JAPANESE DATE SYSTEMS

It may be useful to recapitulate the systems now used by the Japanese in writing dates.

a. According to mythology, the Japanese Empire was founded in the year 660 B.C., and it is from this date that Japanese years are calculated in one system of writing dates. For example, our 1940 is the Japanese 2600, and so on. Type numbers for Japanese aircraft and various other military equipment are often derived from this system of dates. The last two digits of the year concerned, until and including 2599 (1939), are used for the type number; from 2600 (1940) onward, the last digit alone is used. Type "97" was adopted in the year 2597 (1937), Type "O" (zero) in 2600 (1940), Type "1" in 2601 (1941), and so on.*

b. In more general usage, however, is the practice (in use since 1868) of numbering years from the start of each Emperor's reign. A name is chosen for each reign, and a given year is referred to by the number of years that have elapsed since the reign started. The name of the reign of the present Emperor, which began in 1926, is Showa (Enlightened Peace); 1943 is thus the 18th year of Showa, or more simply "Showa 18."

c. The Western or Christian calendar is also in common use among the Japanese.

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*For the use of the term "Zero" as applied to aircraft, see "Tactical and Technical Trends," No. 19, p. 1.

GLOSSARY

17. CODE NAMES OF JAPANESE FIGHTER AIRCRAFT

Code names are used by Allied forces to designate Japanese aircraft. In order to make these code names more familiar, there is set forth below a list of the names used to designate some of the Japanese fighters, followed by a brief explanation of their significance.

1. Hap
2. Rufe
3. Zeke
4. Nate
5. Oscar
6. Claude
7. Dick
8. Perry

Hap, Rufe, and Zeke are all Type Zero aircraft. Zeke is designated by the Japanese as the Type Zero, Mark I, Carrier-borne Fighter, Model 2. The designation of Hap is the same, except that Hap is Mark II where Zeke is Mark I. Rufe is a float-plane fighter, and except for the substitution of the float to replace the wheeled landing gear, this aircraft is believed to be practically the same as Zeke structurally.

Nate is Type 97. It has seen service in various areas, but being an older model, its performance is not up to that of the more recent Hap and Zeke.

Oscar is Type 1, and is believed to be a modification of Nate.

Claude, Dick, and Perry have been less frequently encountered than the fighters above mentioned. They are, respectively, Type 96, Type 98, and Type Zero.

It is well to bear in mind that Japanese fighter aircraft appear to be used with minor alterations by both the Army and Navy Air Services. Zeke and Hap, although used prominently by the Navy, have been reported in operation with Army units also. Likewise, Nate and Oscar, which have been reported most frequently in use by the Army, have, upon occasions of emergency, been used by the Naval Air Service.

For further details on these planes see Tactical and Technical Trends, No. 19, p. 1.

SECTION II

SOME GERMAN VIEWS ON FORTIFICATIONS

A. ELEMENTS OF MODERN FORTIFICATION DESIGN

The German army was noted in the early stages of this war for its offensive operations, but the German High Command has not neglected the art of defensive warfare, in which fortifications may play a major role. The following article, translated from a German military review (1941), presents a summary which is regarded as representing certain aspects of German theory on the design of modern fortifications.

* * *

a. General

Like all the means of waging war, fortifications have been subject to constant change throughout the course of history. New methods of attack give rise to new designs in fortification, and new designs similarly force the development of new means of attack. Every war brings new experiences. Nevertheless, simple basic designs can be recognized, designs that remain uniform at the core. In what follows, these will be discussed especially from the tactical viewpoint, and without consideration of the operational significance of the fortification.

Every fortress is a reinforcement of the terrain, and results from the effort to increase further the superiority of emplaced weapons against a mobile attacker. The defender can choose his position, his "emplacement" in the terrain, and can reinforce and strengthen it according to the time and materials available. On the other hand, the attacker of fortifications is forced to penetrate the defender's position with strong means of assault, or at least so to interdict the defender's action that the attacker can move in close and overcome him in close combat. Even fortifications that lead the attacker to give up the idea of making an attack have fulfilled their purpose.

b. Fundamental Principles

The objective of the defender is to annihilate the attacker by fire. For this purpose, fortifications must withhold their firepower until the moment in which it can be used to decisive effect. Until that time the fortification must provide cover against the effect of the attacker's arms. The attacker's fire effect will be further weakened or dispersed if his observation is made difficult by the concealment of the defensive positions.

Fire effect, cover, and concealment are, therefore, the basic considerations that determine the forms of fortified positions, and which must always be weighed against each other in their development and application.

These factors are mutually related: they complement each other in part, but they also interfere with each other. It is impossible to achieve the ideal of a perfect combination, but a calculated and planned combination must be made. Sometimes the main aim to be attained in the combination of these factors can be

determined by tactical considerations; how this aim can be achieved under given circumstances depends on the individual case. Fire effect has priority over cover: concealment increases and provides a substitute for cover up to a certain point; adequate cover reduces the importance of concealment. However, poor concealment facilitates enemy observation and thereby his operations; faulty concealment can thereby nullify the fire effect planned for the decisive moment. In modern fortifications there is no fundamental distinction between permanent fortifications (i.e., those developed with the means available in peacetime) and field fortifications, except that construction of the latter is limited by war conditions with respect to the outlay of time, labor, and materials possible. In the case of permanent fortifications, the basic designs can be developed and perfected to a correspondingly greater extent.

c. The Shelter

The simplest form of fortress is the shelter. It is an example of a form that developed in field fortifications and has found a place in permanent fortifications. In their modern form, small in size and accomodating only one or two squads or gun crews, shelters can be scattered throughout the battle position and can provide possibilities of cover everywhere. Small as targets, they are easy to conceal, and this can be done most completely by sinking them to the level of the ground surface. Technical limitations may be met if the water table is high. In every case the entrance to the shelter must be higher than the water table, even though account must be taken of the increased costs when the construction must be done in ground water, and when water-proofing must be arranged for.

The disposition of shelters on the terrain depends on the fire plan. In addition, to meet unforeseen battle situations, some shelters may be used to contain reserve units.

In modern fortification practice, shelters are made of reinforced concrete. The thicknesses vary according to the mission of the emplacement, and according to the type and penetration power of the arms expected to be used by the attacker. In the case of small and well-concealed shelters, one can take into account the fact that the effectiveness of attacking arms will be relatively limited. With the methods used in permanent fortifications, shelters can easily be fitted out so as to make them livable for long-term occupation. The degree to which shelters are livable has tactical significance, since it helps in determining how long a group can garrison the shelter without relief. The longer this period, the fewer total effectives are needed.

However, shelters are merely cover: fire effect is not possible from them, and the garrison has to leave them for firing assignments and combat. Here arises a serious danger: that in large-scale battle, if the attacker covers the emplacement with heavy fire and smoke, the defenders will not recognize in time the decisive moment when the enemy infantry nears the position. The attack may reach the advanced shelters and put them out of action before the defenders can emerge and organize their defense.

This danger must be met primarily by arrangements for suitable observation. It is difficult, however, to guarantee that the arrangements will function at the critical moment. The solution may be sought by using telescopes which can be sighted in any direction, in armored observation towers, or by using observers in exposed or partially protected positions. The first method has the disadvantage of spoiling the complete concealment which is the major advantage of a shelter, and the second method lessens the protection afforded to personnel.

Even if they have been installed in advance, firing emplacements which are open and have covered approaches or lateral communications can betray the locations of shelters to enemy observation; therefore these open emplacements demand great care in construction.

d. The Loophole Position

Summing up, it may be said that as regards cover and concealment, shelters can be developed almost to ideal perfection--but at the cost of the fire effect. The more attention given to cover and concealment, the less assurance that the planned fire effect can be realized at the decisive moment. These disadvantages of the shelter are reduced if it is made possible to fire from the shelter (or from some special combat space in it), thus combining cover with fire effect. The simplest means for accomplishing this is the loophole, and the result is the loophole position.

(1) The Wall Loophole

The simplest design is the wall loophole. This can be used for observation when firing is not in progress; in the latter case, a second loophole is needed unless the loophole has been widened to permit both observation and fire. The loophole position, however, has a disadvantage: concealment is largely sacrificed in the interest of fire effect. The loopholes must be placed above ground level; often, in fact, rather high above it because of vegetation. Additional space, above the loopholes, is necessary for the movements of the gunners, and the cover must come above this space. All this means a rather high structure. Only in particularly favorable conditions, for example on rising ground, can the structure be adapted to the ground and thereby given suitable concealment.

In addition it is necessary to allow sufficient space for traversing and elevating the gun in order to obtain adequate fire effect. The result of this requirement is loophole "mouths" of greater or lesser size, depending on the wall thickness. These mouths can hardly be camouflaged without diminishing observation and reducing fire effect. Especially in the critical moment when the gun goes into action, these mouths are easily detected and attacked.

The size of the outer openings can be reduced by designing the loopholes in the shape of an $\gg\ll$; in this case the guns are emplaced partly in the thickness of the wall, and this arrangement makes it easier for the crew to swing the gun laterally. However, by this arrangement the gun no longer has the protection of the full thickness of the wall. This disadvantage can be reduced,

but not eliminated, by armorplating the loophole.

(2) Loophole Armorplate

The logical carrying out of this principle leads to the development of loophole armorplate; with only a fraction of the wall thickness, this armorplate can offer the same resistance as the thick reinforced concrete. The loophole opening can be made correspondingly smaller. Nevertheless, the open loophole is still easy to detect, especially since the armorplate is harder to camouflage than a concrete wall. Nor can this disadvantage be eliminated by special construction of the loophole shutter. The place where a vertical piece of armorplate is joined to the reinforced concrete structure is a weak point, and requires special attention in designing. Furthermore, the elevation of the structure remains unchanged. To reduce the elevation, one possible solution is to use a flat roof of armorplate. Even in this case, a considerable cubic volume is still needed to give room for handling the gun and the crew--aside from the fact that the structural joints become more complicated, and that construction costs are greatly increased by the use of armorplate. These disadvantages are especially notable in the case of frontal loopholes, and so another possible solution is by siting guns for loophole flanking fire only. This solution, however, simply substitutes one problem for another, since frontal fire is absolutely indispensable for repelling attack. Furthermore the terrain often gives the attacker opportunities for flank observation, and positions for combatting these flanking loopholes--or, the attacker may acquire such vantage points in the course of the battle.

(3) The Loophole Position and the Fire Plan

An advantage of the loophole is that, up to a certain point, it permits the preparation of an almost automatic fire-plan. The place of each gun in the fire plan is clearly indicated by the position of its loophole. But here again is a point of weakness: if guns are put out of action, gaps in the fire may develop, especially if the defender is depending on the "automatic" functioning of his fire plan. A fire plan with overlapping fires, arranged in depth, minimizes this weakness but increases the number of installations and weapons employed. Therefore, the exclusive use of loopholes imposes a certain rigidity on the defense, and does not permit the defense to adapt its fire to changing and unforeseen combat situations. Some guns may remain idle because, in their sector, no target is visible to them, while in other places the guns may not be adequate to combat the targets offered. This problem can only be met by a defender who is energetic, and who views the loophole position only as a shelter cover which must be abandoned if necessary in the interest of fire effect.

(4) Large Weapons in Loophole Positions

The difficulties in installing loophole positions increase with the size of the guns. Fire missions will occur in which emplacement behind loopholes seems desirable and suitable not only for machine guns but also for guns of larger

caliber, especially antitank guns. These larger guns are the ones which can or should be limited in their field of fire to a specified sector. In the case of cannon, the problem of embrasures is even more difficult, since, apart from the size of the weapon, a greater clearance is needed for aim, especially with regard to elevation. The result is rather complicated and expensive construction.

On the other hand, guns emplaced in cover are thus provided a certain measure of protection and better possibilities for concealment (i.e., in comparison with open works), although these possibilities are limited in the case of aerial attacks. Further improvements may be made by providing bomb-proof quarters, in shelters, for the gun crews and for ammunition, and by arranging routes of withdrawal and alternate positions. A simple problem, and one which can be easily solved, is the installation of high-trajectory weapons under cover from which they are capable of firing. High trajectory fire is especially effective in supplementing and overlapping frontal fire.

e. The Armored Turret

Perhaps the most compact form of combat position is the armored turret, consisting of armorplate with a circular base and a rounded cover. This form affords enemy fire the smallest target and the least favorable surface of impact. Its elevation is kept down to the indispensible minimum needed for the service of the weapon. Also, the solid union of an armored turret with the concrete block offers no great structural difficulties. On the other hand, turrets are very costly. Protection can be obtained in any degree desired by varying the thickness and quality of the material, but the question of cost and the technical problem of transportation weight here approach their maximum limits. Even in the case of turrets, we find the opposing, interacting relationship between the objectives of fire effect and concealment. The latter is very difficult if great fire effect is to be achieved.

Turrets may stand in the open and thus have an all-round field of fire, or they may be built into the terrain and have a field of fire limited to a predetermined sector. A turret with only one loophole affords the smallest possible target and can thus be adapted to almost any terrain. However, a turret loophole gives no more tactical fire effect than any other loophole, and it costs much more. If the number of loopholes is increased to two or three, giving a firing radius of 200 degrees, this immediately complicates the factor of concealment because the semi-circular form of turret necessarily becomes more visible. However, the turret with several loopholes does solve one major problem in the arrangement of the fire plan. Even more important, it permits the same weapons to be used for other missions when they are not serving their principal mission in the fire plan. In this way the rigidity of the prepared fire plan is to a certain degree reduced, and thus a weakness is remedied. Furthermore, several loopholes make it possible, at least in emergencies, to use several guns. The multiple-loophole turret thus gives a much greater fire effect, without additional expense.

The advantages just discussed are gained especially in the case of turrets constructed for all-round fire: either with guns mounted so as to rotate inside the turret, and fire through a number of loopholes, or with the turret itself so constructed as to rotate. The rotating turret is more expensive and demands special provision for the protection and operation of the rotating mechanism. Such turrets realize a maximum fire effect with a minimum use of space, but they can at best be only incompletely concealed.

This disadvantage is eliminated by building disappearing turrets, which are raised out of their cover only for firing, but this naturally involves a further complication and expense. In addition there is the difficulty of observation and the problem of determining the correct moment for raising the turret. At that moment no concealment is possible, although the fire effect may be increased by the element of surprise involved. Even heavy weapons, especially cannon, can be built into turrets. For these weapons, only rotating turrets can be considered; otherwise the dimensions become too great and fire effect is severely limited. The protruding barrel of the gun is its most sensitive part; it can, however, be protected by special casing, or can be so designed as to permit easy replacement. Further effective protection can be achieved by the careful siting of the turret on the terrain, care being taken not to spoil the fire effect.

It is particularly difficult to protect antiaircraft guns, but it is relatively easy to solve the problem of sheltering in turrets the smaller of the high-trajectory weapons. Observation posts can also be set up in turrets.

f. The Combination of Defensive Elements

Shelters, loophole positions, and turrets are the basic units which enter into the design of all modern fortifications. The central problem of all fortification design turns on the construction of the positions from which the fire effect must be achieved, and on their adaptation to the terrain. In the construction and lay-out of all shelters which are designed not for combat but for the convenience and comfort of troops, the purely technical possibilities and the questions of cost are the determining factors.

It is a significant fact that a greater number of weapons or living quarters can be more cheaply assembled in one larger structure than in many single units. From the standpoint of tactical considerations, the latter type of lay-out offers the advantage presenting a smaller target, adapting itself better to the terrain, and permitting a more thorough control of an area. In the larger structure, it is possible to achieve the combination of various arms and greater numbers of combat effectives under more closely unified leadership, as a center of resistance.

Thus we have many forms in modern fortifications: so many as to be confusing when all are viewed at once:

(1) Simple (and more complex) shelters for accommodating gun crews, as well as for special purposes such as serving as a command post or providing

storage space for rations, ammunition, and reserves.

(2) Loophole positions (single or multiple loopholes), with or without adjoining shelters.

(3) Combat positions with turrets, to contain various weapons or to be used as observation positions, likewise with the necessary adjoining shelters.

(4) Smaller and larger aggregates (or works-Werke) with various weapons, behind loopholes or in turrets, with adjoining rooms and mechanical installations.

(5) Larger combinations of works and single positions, with gallery connections to separate works and groups of works.

g. Entrances and Communications

A further problem is presented in the matter of entrances. On the number and size of the entrances depends the speed with which the crew can emerge from cover in case of need.

On the other hand, every entrance offers a possibility of attack to the enemy and must therefore be given special protection. High entrances under strong cover have deep recesses, and it is therefore particularly difficult to camouflage them. They complicate, and also impede, exit. Armor-plated entrances reduce this disadvantage, but in their turn increase the cost.

When open communications are used, trampled paths will result in spite of all precautionary measures, and the aerial photograph of these paths betray even installations well camouflaged against surface observation. Open communications, also, are not safe under enemy fire. The difficulties connected with both entrances and communications can be relieved by using gallery communications These permit covered liaison, the supply and transfer of effectives, and simple bombproof routes for telephone lines as well as for supply lines of all sorts. Bombproof resting rooms, command stations, mechanical installations, and depots for rations and munitions and the like, can be connected with these galleries with relatively little additional cost. On the other hand, they require a considerable outlay in construction time and cost, if their bombproof quality is not to be nullified. Favorable earth and ground water conditions are prerequisites for the technical possibility of constructing such works.

h. Obstacles

Finally, obstacles must also be considered among the types of permanent fortifications. Obstacles are erected against infantry and tanks, principally in front of the main line of resistance, but they may also be effective deep within the main battle position. They result in a considerable heightening of the fire effect, because they impede the attacker in his forward movement and thus to a greater degree force his exposure to the effect of the defensive weapons. The

obstacles must therefore lie within the effective range of the defensive weapons and must be dominated by their fire. Here, especially advantageous use can be made of flanking and diagonal fire. The obstacles will in general be erected continuously, but gaps may serve to canalize the enemy attack in accordance with the intentions of the defenders. Observation and fire coverage of the obstacles must be maintained also at night and in fog. An important requirement is that the obstacles must not interfere with one's own observation and field of fire, even when allowance can be made for supplementing this fire by high-trajectory weapons. It is very important, in addition, that the lay-out of the obstacles on the terrain does not enable or facilitate recognition of the defense system, especially from the air, thereby exposing the location of otherwise well-concealed structures.

Against infantry, wire obstacles are the common form, and are effective when sufficiently wide or when laid in several bands; but dry and waterfilled trenches, reinforced concrete bump obstacles, post obstacles, rail obstacles, and "hedgehogs" of various kinds, especially steel structures, as well as combinations of these forms, are used against tanks. The danger of interfering with one's own field of fire, and the danger that the obstacles may be used as cover by the attacking infantry areespecially great in the case of antitank obstacles of all kinds. The former danger can be met by reducing the height of the obstacles; the latter by selecting the least massive form possible and by establishing a fire effect which will enfilade the obstacle. These requirements are often difficult to fulfill in practice. All effective antitank obstacles are high in cost. Mines are arranged and concealed more easily and more rapidly, and leave the field of fire open, but they also constitute a risk to one's own mobility in the forward area. A position on terrain which is impassible to tanks should therefore always be sought, and this factor may under certain circumstances decisively influence the choice of the general position.

i. Conclusion

It was not the purpose of the foregoing discussion to indicate the best form of fortification, but simply to report the problems which arise in preparing them. An absolute optimum form does not exist. Fortifications are a combat medium; in combination they must meet operational requirements, and individually they must meet tactical requirements. As in all such matters, advantages and disadvantages have to be weighed against each other in the particular case; this consideration will determine the location of the fortifications on the terrain, and sometimes their form. Important, further, is the recognition of the fact that no one form guarantees success, but only the fighting spirit and morale of the troops placed in them. To achieve and increase this, good weapons are needed, and also suitable fortification designs. Without the will to fight, however, even the best designs are useless, as the fate of the Maginot Line showed.

B. THE FAILURE OF FORTIFICATIONS IN THE 1940 CAMPAIGN

The following article, translated from a German military review (1941), is interesting in its critical analysis of the weaknesses of French, Belgian, and Dutch fortifications against the German attack in 1940. It is also noteworthy that the writer evidently feels it necessary to argue the point that the experiences of that campaign do not prove that fortifications are outmoded.

* * *

a. General

The press is often accustomed to represent the controversy about permanent fortifications in such a light that the reader has to conclude that their value does not bear a reasonable relationship to their cost in time and money.

The mere fact that every one of the fortified positions attacked by German troops fell quickly, does not in itself justify any conclusion as to the value of permanent fortifications. In the war on the Western Front, weaknesses on the opposing side favored our successes.

Without any desire to minimize in the least the unprecedented achievements and offensive power of our troops, the following must still be said:

A permanent fortification that is to be fully equal to its mission must meet the following requirements:

(1) It must block all avenues of attack (even those that seem hardly practicable), leave no gaps suitable for breakthrough, and be uniformly strong everywhere. (It must be understood, of course, that a weaker type of lay-out can be compensated for by favorable terrain.)

(2) In estimating the strength of construction necessary, attention must be paid to the effects of all modern offensive weapons.

(3) The defense of permanent fortifications must be conducted offensively, as any defense should.

b. French Fortifications

The French land fortifications and their defense met these requirements in some places--in fact, along the entire territorial boundary between Switzerland and the Channel coast, they left no gap--but their strength was quite variable. The strongly developed sectors of the Maginot Line proper (except for the support position at Montmedy (Work 505) which could be approached from the flank) were not seriously attacked. Therefore, a conclusive judgment with respect to these sectors can not be given. The German attacks, except for that on Work 505, were directed only against those portions of the position which were more weakly developed. Because of the type of structure (only individual works in a single line) and the limited strength of the construction, and because of an appreciable lack in depth, portions of the French territorial defense possessed no worthwhile fortifications.

The flaws lay, however, not only in fortresses, but also in the spirit of the defense. Not only the inferiority of their air and armored forces, but above all the training and the spirit of the French army weakened the offensive power of the French soldiers and their capacity of resistance. The basic failure, complete concentration on the defensive and a corresponding training program for French soldiers, robbed the fortifications of a large part of their power to repel and to hold. In addition, all of the attacks delivered in June against fortifications were made easier by the fact that artillery and field troops, and even portions of the fortress troops, had been withdrawn from the fortified fronts for the battles in Flanders and for garrisoning the Weygand line.

The French overrated the strength of defensive warfare and at the same time underrated the striking power of the German Wehrmacht, which was combined with special attack tactics for use against permanent fortifications.

A few examples may clarify the points stated:

(1) The first breakthrough at Sedan and to the north struck the junction between the Ninth and the Second Armies (Corap and Huntziger). At this place, where a strategic breakthrough was not expected, the prepared position was not only extremely weak and lacking in depth, but both armies, in spite of repeated requests by their leaders, had been given especially poor consideration as to troop reserves and defensive weapons (for example, antitank and antiaircraft guns).

(2) Work 505 (at the Montmedy bridgehead) courageously resisted for almost 3 days, until the entire garrison was dead.

The troops fighting outside the work did, indeed, stubbornly defend the village of Villy, but the garrison was lacking in sufficient offensive spirit to throw back the Germans who reached the area of the fortification.

(3) The attack on a work heavily damaged by shell fire southeast of Weissenburg was shattered by the stubborn defense; further breakthrough attempts here were abandoned.

(4) The breakthrough west of Lembach in the mountainous, forested terrain of the northern Vosges on June 19 was successful because the French garrison had already been greatly weakened (in artillery and reserves) and permitted the attacker to approach unimpeded to within 100 meters from the fortifications.

(5) The many attacks conducted from the rear against the French border fortifications after the breakthrough and encirclement (for example, Maubeuge and west of Rohrbach) met no active defense whatever. These attacks were made easier by the fact that the rear sides of the fortified installations were weaker, and therefore could not resist even light artillery at short range.

c. Belgian Fortifications

The Belgian fortifications were also founded on obsolete notions. The numerous installations of the border defense position were in part not garrisoned adequately, and in part not at all, so that they could hardly be defended against the lightning assault of the Germans. Not one of the major defense positions could be held until French and British help arrived. In their quick collapse, the decisive factor was the surprisingly swift seizure of Fort Eben-Emael. This could be traced back to the fact that the unprecedented courage of the German parachute troop attack had crippled the fort, which in any event had inadequate fire coverage of the area to be defended. Counterattacks were limited to weak attempts from the fort, from neighboring units, and from the responsible 7th Belgian Division.

With the fall of Eben-Emael and the occupation of undamaged canal bridges both at Vroenhoven and Veldwezelt, the whole major defense position collapsed.

The Dyle position would have been able to hold out longer if it, and its extension along the Meuse from Namur, had been developed as far as France. Even the otherwise useful northern sector of Wavre--Lyon--Lierre lacked the necessary depth.

It was therefore a matter of piecework, and south and north of Namur, as well as at Wavre, easy breakthroughs were made on May 15. The consequence was that even the northern sector had to be evacuated on May 16.

Even the fortress of Antwerp played no part; its northeastern front was broken through on May 17 without offering noteworthy resistance. The evacuation of the Dyle position on May 16 and the occupation of the city of Antwerp on May 18 made the remainder of the Antwerp bridgehead also worthless.

The bridgehead at Ghent, in itself well developed, both to the north (after the fall of Antwerp and the loss of the lower Scheldt) as well as to the south (after the failure of the British) lost its support and had to be evacuated on May 23.

If one wishes to summarize the value of the Belgian fortifications and the reason for their failure, the following will be admitted from what has been said:

(1) The land fortifications of the Belgians were not based on a fundamental, clear plan and, in part for political reasons, were much too extensive for the little country and the weak army.

(2) The help of the French and the British, on which the Belgians had counted in planning the strength of their installations, failed.

(3) The attack power of the German Wehrmacht had been underestimated.

d. Dutch Fortifications

What has been said about the Belgian land fortifications applies to an even greater degree in the case of the Dutch fortified installations.

The Dutch attempts to place fortified positions in the way of the German assault shows a deplorable error in judgment, both of the German power and of their own situation. The Meuse-Ijssel position played no role whatever, any more than did the Peel-Raam position, which was broken through at Mill on May 10-11. The Grebbe line held up the attack at Grebbeberg on May 12 only for a matter of hours. In the new positions there was hardly any possibility of an orderly combat leadership, since at no time did they have communications; every loophole position was on its own. The situation of the fortress of Holland was already critical when the German parachute troops on May 10 took possession of the Moerdijk, Dordrecht, and Rotterdam bridges--undamaged.

Even under the assumption that the fortifications would only have to hold until the arrival of outside aid, about 4 to 5 days, the main defense position was too weak.

e. Conclusion

If there is any inclination to draw from the role which the land fortifications played in the campaigns of 1939 and 1940 the conclusion that their value did not correspond to the costs of installation, the following should be said in summary as an opposing argument:

(1) The German Westwall accomplished its operative mission of giving the command a free hand in the east. Whether it would have also held against a tactical attack was of course not demonstrated, but it may be assumed with certainty that it would have met the test, since on the German side the necessary prerequisites had been met.

(2) The fact that the enemy territorial fortifications did not fulfill their purpose was due to the defensive flaws detailed above, or to the incapability of the commanders to utilize them correctly.

Wherever, in individual cases, the defense of the fortifications was inspired with the proper spirit, the results confirmed the permanently sound principle that fortifications increase the combat power of the army, and that therefore, properly used, they cannot be dispensed with.

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SECTION I

AIR

1. ITALIAN FIGHTER PLANES

a. Macchi-202

The Macchi-202, one of the best Italian fighters, is a single-seat, low-wing cantilever monoplane, powered by one, twelve-cylinder, Daimler-Benz 601 A/1 engine of the inverted "V" liquid-cooled type. It is of all-metal construction with smooth stressed skin and has moderately tapered wings with a span of 34 feet 8 inches and a gross area of 181 square feet. The fuselage is oval, with the cockpit over the trailing edge of the wing. Camber-changing flaps are interconnected with the ailerons. It has an adjustable stabilizer and a hydraulically operated landing gear retracting inward into the wings. The tail wheel is fixed.

The latest type of engine is reported to develop 1,150 hp at 16,000 feet, which would permit a sea-level speed of 295 mph, a cruising speed of 310 mph at 18,000, and a maximum speed of 360 mph at 20,000. The airplane is believed capable of reaching an altitude of 18,000 feet in approximately 7.2 minutes.

The service ceiling with a normal load is 35,000 feet,and the range is 425 miles at normal cruising speed. On some models the engine is fitted with an air filter connected to the landing gear. The filter apparently operates only when the wheels are down. The metal propeller is three-bladed.

There are apparently two fuel tanks, one in the fuselage below the pilot's seat, holding 71 U.S. gallons, and the other behind his head and shoulders with a capacity of 34 U.S. gallons. Both tanks are of standard light-alloy construction and are self-sealing, having five protective layers on the inside. However, a recent airplane is reported to have had three tanks, a main tank aft of the cockpit holding 111 U.S. gallons and an auxiliary tank of 25 U.S. gallons built into each wing next to the fuselage, each connected with the main tank.

The standard armament consists of two synchronized 12.7-mm Breda machine guns mounted over the engine and firing through the propeller. There is provision for mounting two 7.7-mm guns in the wings outboard of the propeller arc, but none have been found actually installed. This aircraft is believed to be equipped to carry two 220-pound bombs.

Eight-millimeter armor protection is used for the head, shoulders,and bucket seat, but no bulletproof windshields have been reported.

This airplane has been almost entirely used for fighting and ground attack. It has operated extensively against Malta, and in the defense of the North African ports in the Libyan campaigns, and is now in action in Tunisia.

b. Reggiane-2001

The Reggiane-2001 is another Italian fighter used for ground attack. It is a single-seat, low-wing, cantilever monoplane with a comparatively short, tapered fuselage. The elliptical wings have more curvature on the trailing edges

than the leading edges, and rounded tips. The single fin and rudder have a very deep chord and are approximately triangular in shape. The leading edge of the fin is straight, and the trailing edge of the rudder is slightly curved. Split flaps are fitted and are continuous under the fuselage. The main wheels of the landing gear turn through 90 degrees during retraction and appear as slight bulges beneath the wing. The tail wheel is non-retractable. The cockpit is inclosed and is over the wing.

The airplane is powered with a Daimler-Benz 601A/1 engine, as used in the Macchi-202, which develops 1,150 hp at 16,000 feet. This is believed to give a sea-level speed of 290 mph, a cruising speed of 300 mph at 18,000 feet, and a maximum speed of 350 mph at 20,000 feet. The airplane can climb to 18,000 feet in slightly over 8 minutes. Service ceiling with normal load is 34,000 feet, and the range is 730 miles at normal cruising speed. There is a coolant radiator with controllable flaps under each wing and an oil cooler mounted beneath the engine. A standard type of air cleaner is incorporated forward of the long intake to the supercharger. The three-bladed propeller is reported to be made of solid duralumin.

It is believed that the aircraft was originally designed to carry one fuel tank in the center section with a capacity of 172 U.S. gallons. However, at least one is reported to have three tanks, one behind the pilot's seat of 22 U.S. gallons capacity. The other two tanks are at right angles to the fuselage, extending 2 1/2 feet into each wing; the forward one holds 82 U.S. gallons, and the other 54 U.S. gallons.

A flat pane of splinter-proof glass forms the windshield of the cockpit. Behind the pane is a sliding canopy of plexiglass which can be slid to the rear, permitting exit by parachute, or can be fixed in intermediate positions.

The basic armament of the Reggiane-2001 consists of two 12.7-mm synchronized Breda machine guns, fitted beneath the top cowling with the breeches accessible to the pilot and firing through blast channels; also, two 7.7 guns, one in each wing. The original design is believed to permit the installation of a carrier for light bombs or a container for antipersonnel bombs. Another report suggests a version of this airplane (Re-2005) fitted for carrying one or two small torpedoes and equipped with the 1,500 hp Isotta Fraschini L 180 I.R.C.C. 45 engine, which would give a performance comparable to the Re-2001 fighter.

The pilot's bucket seat and his head and shoulders are protected by 7-mm and 9-mm armor plate respectively.

This airplane has been reported in action on the Tunisian front.

2. FLAK DIRECTIONAL ARROWS TO GUIDE GERMAN FIGHTER PLANES

a. General

When Allied aircraft approach behind cloud layers or out of reach of antiaircraft batteries, the Germans have perfected a method of "skywriting" a red arrow of bursting shells to point out their approximate direction and height to German interceptors. Red flak bursts have been frequently reported by pilots, unaware of its purpose, who were flying over occupied territories by day. The German instructions for firing this type of indicator have recently come to hand.

Although such a pattern itself has not been reported by pilots, red marker-projectiles are fired to form an arrow measuring 3,500 to 3,850 yards long. The "shaft" consists of four or five bursts spaced at about 700 yards, while six bursts form the "point." The arrow is almost horizontal, aligned on a bearing from the gun position to the approaching aircraft, and at approximately their height. (This may explain why the pattern has not been reported.) The arrow can be formed in from 5 to 15 seconds, and in calm weather lasts 3 or 4 minutes. Red practice ammunition is usually fired, but HE is used when other ammunition is not available.

b. Instructions for Firing Directional Arrows

(1) Instructions for Firing

Flak directional arrows are only fired if friendly fighters are aloft or in readiness, and if no hostile aircraft are in range of the gun position or likely to come into range shortly.

In accordance with a directive, flak directional arrows are also to be fired if hostile aircraft, flying above the clouds by day, can only be picked up by directional indicators, and are out of range of the flak. If friendly fighters are above cloud, the flak directional arrow must be fired at the height of the hostile aircraft. If these same fighters are below cloud, the flak directional arrow must be fired close beneath the cloud base.

(2) Firing Data

The height of the enemy aircraft is taken to the nearest 1,000 meters (approximately 3,000 feet), and a future bearing is obtained.

Two salvos each are first fired by three guns to form the "point" of the arrow, and then five (or, as the case may be, four) rounds by the fourth gun to form the "shaft."

(3) Procedure for Firing

(a) Preliminaries

At each gun, a table of quadrant elevation and fuze data must be provided for gun crew members numbers 1 and 6 (see table). Instead of tables, the data can be shown on the guns as follows: for No. 1, colored marks on the elevation scale, with corresponding height figures; for No. 6, data, in accordance with the table, painted on the left-hand side of the mounting.

Firing of flak directional arrows must be preceded by explanation and practice.

(b) Firing Drill

(1) The executive officer designates a primary gun for firing the "shaft." Taking the line from the gun position to the hostile aircraft, the firing of the "shaft" should be allotted to one of the center guns. As already stated, this gun has no part in firing the "point."

(2) Height and bearing are taken and called out. The executive officer takes height to the nearest 1,000 meters and calls it to the gun detachment commanders. He adds lateral deflection to the bearing; it should be about 350 to 400 mils. Future bearing is passed by the executive officer to the gun detachment commanders.

(c) Example of Order

"Take post - aircraft 8 o'clock - flak directional arrow - height 4,000 (i.e., meters--14,500 ft) - primary gun "A" - bearing 6,300 (i.e., mils = approx. 354°) - fire."

No. 1 sets quadrant elevation for the height ordered (from his table) on the elevation scale. He reports, "No. 1 set." No. 2 sets the bearing ordered and reports, "No. 2 set."

With the 88-mm gun, models 18/36 and 37, No. 6 sets fuze for the height ordered (from his table) on the fuze-setting machine. When the fuze is set, the round is loaded at once. No. 3 fires on the order of the gun detachment commander.

With the 105-mm gun, models 38 and 39, fuzes for the height ordered (from the table) are set by means of two fuze-setting keys. No. 3 loads the first round on the order of the gun detachment commander.

Before firing the first salvo, the gun detachment commanders report "ready" to the executive officer after the required data have been set. The executive officer then gives the order "fire." Subsequent salvos, after the appropriate data are set, are fired as quickly as possible without further orders.

With the 88-mm (18/36 and 37), rounds must be fired at intervals of 2 seconds, and with the 105-mm (38 and 39), at intervals of 2.5 seconds. Firing must be in the following order: 1st and 2nd salvos from three guns for the "point," followed by five or four rounds from the primary gun for the "shaft."

(d) Cease Firing

This is ordered by the executive officer as soon as he sees that friendly fighters have recognized the hostile aircraft, or if hostile aircraft come into range. The appropriate order is: "Cease firing flak directional arrow." If this order is not given, firing of the arrow is repeated.

c. Firing Data Tables

(1) Tables for 88-mm Antiaircraft Gun (18/36 and 37)

(a) Table for No. 6 (Fuze-Setting in Units from the Cross)*

Height	1,000 m	2,000 m	3,000 m	4,000 m	5,000-8,000 m
Arrow Point (1st and 2nd salvos)	180	230	290	330	340
Primary gun					
1st round	155	205	265	305	315
2nd round	130	180	240	280	290
3rd round	110	160	220	260	270
4th round	85	135	195	235	245
5th round	60	110	170	210	220

(b) Table for No. 1 (Quadrant Elevation)

Height	Height
1,000 m = 15°	5,000 m = 43°
2,000 m = 23°	6,000 m = 50°
3,000 m = 30°	7,000 m = 55°
4,000 m = 37°	8,000 m = 60°

*Fuze-lengths are measured in degrees from a cross or zero mark; e.g., on the fuze-setting key. The German fuze scale reads from 0 to 350, the numerals being reference numbers which indicate definite times of flight.

(2) Tables for 105-mm Antiaircraft Gun,38 and 39

(a) Table for No. 6 (Fuze-Setting in Units from the Cross)

Height	1,000 m	2,000 m	3,000 m	4,000 m	5,000-8,000 m
Arrow Point (1st and 2nd salvos)	200	240	280	300	340
Primary gun					
1st round	175	215	255	275	315
2nd round	150	190	230	250	290
3rd round	105	145	180	205	245
4th round	80	120	160	180	220

(b) Table for No. 1 (Quadrant Elevation)

Height	Height
1,000 m = 15°	5,000 m = 38°
2,000 m = 20°	6,000 m = 43°
3,000 m = 25°	7,000 m = 48°
4,000 m = 32°	8,000 m = 53°

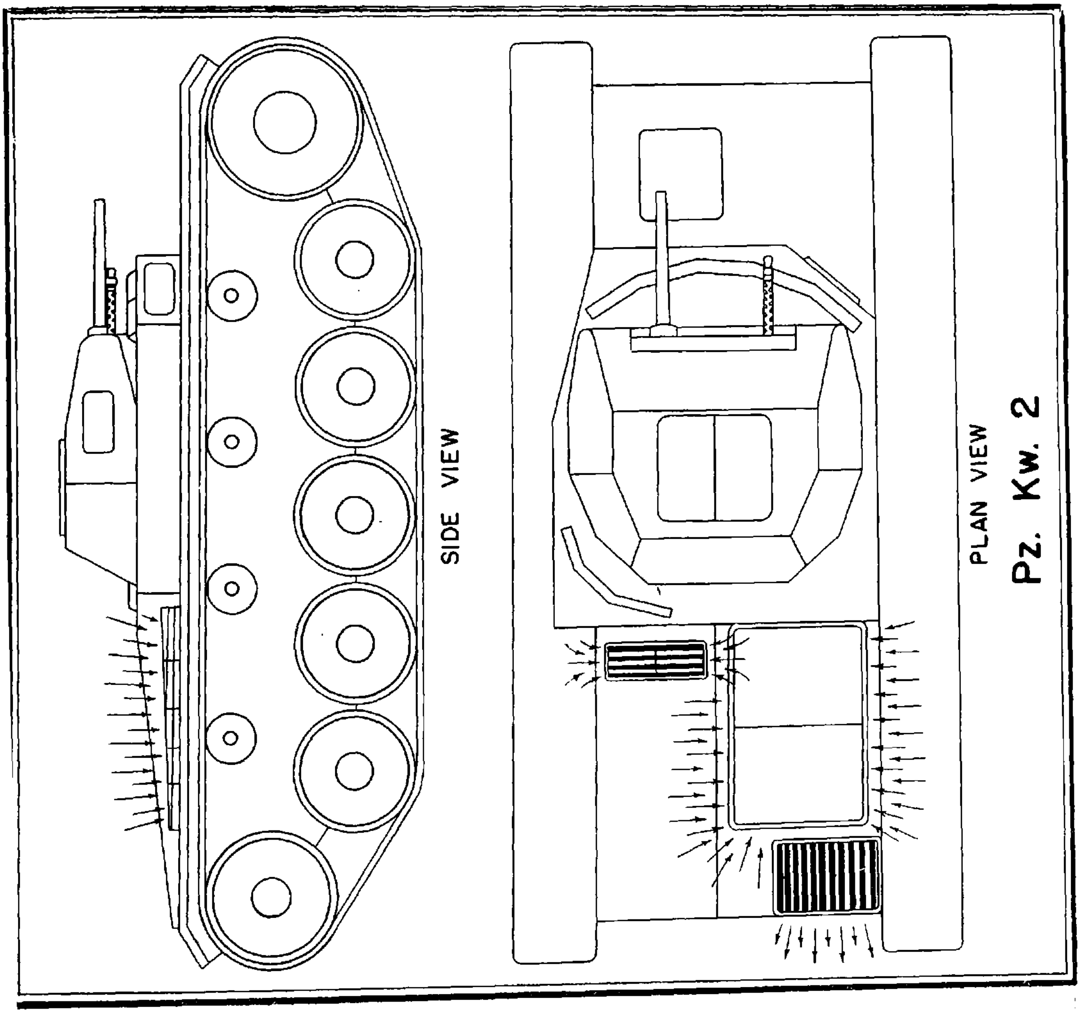
ANTITANK

3. GERMAN 75-MM ANTITANK GUN

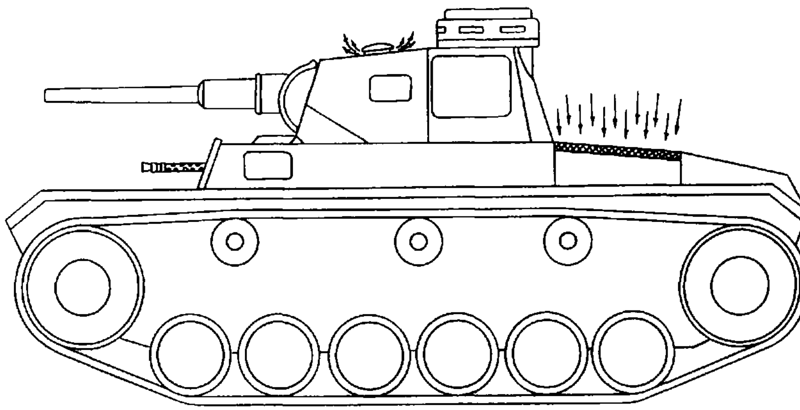
In case any of the 75-mm Pak 97/38 guns fall into the hands of our artillery, it should be a fairly familiar weapon. The gun is a long-barreled adaptation of the French "75" with some interesting modernizations. Noteworthy are the double shield with an air space between the two plates, the perforated Solothurn muzzle brake, the odd-looking split trail, which would seem to give a large and rapid traverse, and the third smaller wheel set under the trail spades. This third wheel can be folded up flat on top of the trail. The carriage is quite similar to the 50-mm German antitank gun. With a screw breech-block like the old "75," the piece is typically French. An earlier type of French 75-mm dual-purpose antitank-field piece, said to fire a 14.1-pound solid shot at 2,100 f/s velocity, was completed in March 1940. The present weapon appears to be a development of this gun.

4. VULNERABLE SPOTS FOR INCENDIARY GRENADES ON GERMAN TANKS

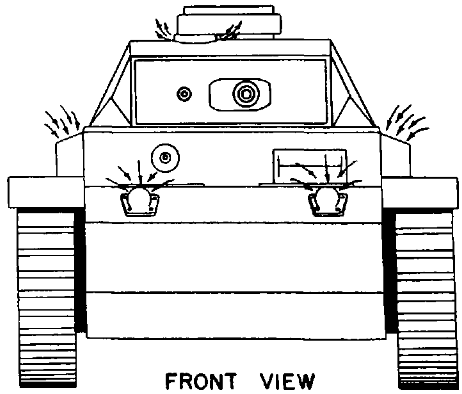
In attacking enemy tanks at close quarters with Molotov cocktails or incendiaries, the air intakes are among the most vulnerable points. It is important, therefore, that the location of these intakes and outlets be known, as the flame and fumes of a grenade thrown against an intake while the engine is running will be sucked inside, but if the grenade lands on an outlet, they will be blown clear of the tank.



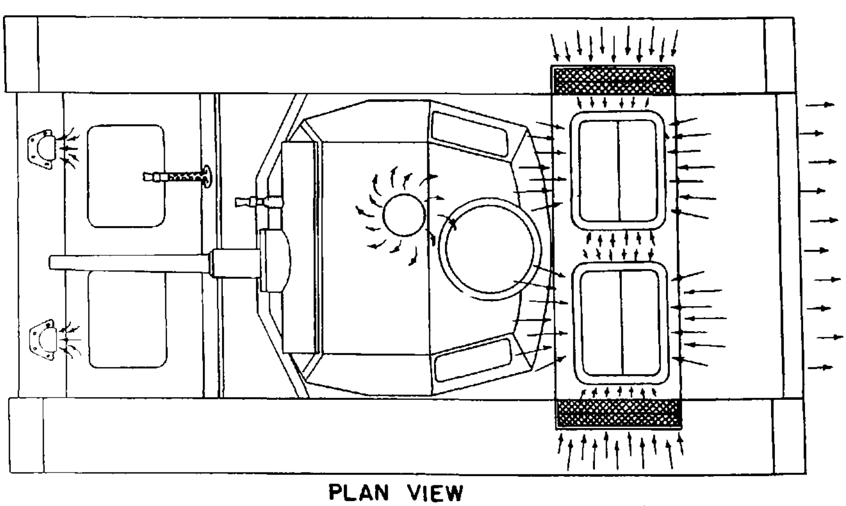
The best targets are the flat top-plates behind the turret. Side intakes are invariably protected by a vertical baffle. The accompanying sketches show the "soft spots" in German tanks Pz.Kw. 2, 3, and 4.



SIDE VIEW

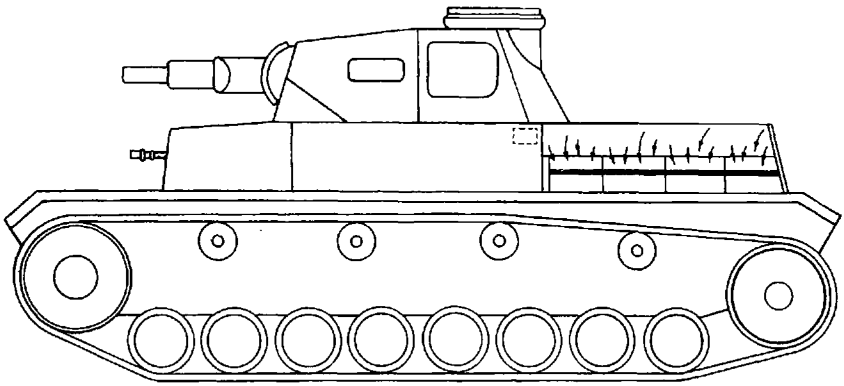


FRONT VIEW

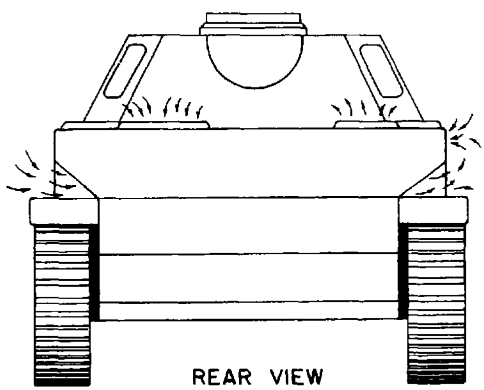


PLAN VIEW

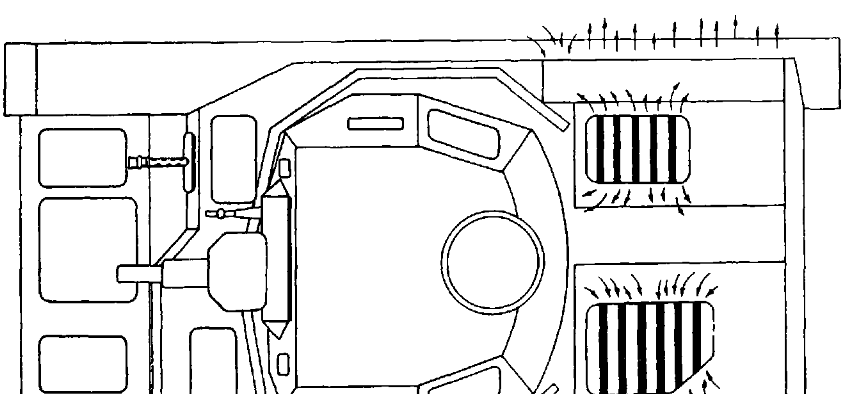
Pz. Kw. 3



SIDE VIEW



REAR VIEW



PLAN VIEW

Pz. Kw. 4

5. GERMAN ANTITANK UNITS IN REARGUARD ACTION IN AFRICA

According to reliable reports, the tactical use of antitank weapons by German units operating on rearguard missions, is as follows: First, the 88-mm dual-purpose guns fall back, then the combat engineers, and the antitank guns last. Unless the attack is too overpowering, the antitank units, before withdrawing, stand fast for a length of time designated in orders. If the gun positions are undetected, antitank fire is opened only at the last possible moment, since the German 50-mm guns are not effective against General Grant (U.S. M3) and General Sherman (U.S. M4) tanks at long ranges. If the gun positions are known to the enemy, long-range fire is employed.

ARMORED FORCE

6. OBSERVATIONS ON GERMAN EMPLOYMENT OF ARMORED INFANTRY

The following account of the tactics of armored infantry was taken from a German training manual.

a. General

(1) Tasks

The rifle company transported in armored vehicles is a particularly strong unit in the attack because of its mobility, high fire power, and armor protection. The latter makes it possible to fight from the vehicles, but this is very rarely done. These units habitually dismount and fight on foot. The armor protection permits them to approach the enemy closely before dismounting. In view of its high allotment of heavy weapons, the company is able to carry out independent tasks.

Its main role is cooperation with tank units in carrying out the following tasks:

(a) Quick mopping-up and consolidation of ground overrun by the tanks;

(b) Supporting the tank attack by overcoming nests of enemy resistance, removing obstacles, and forming bridgeheads;

(c) Protection of assembly and bivouac areas.

b. Training

(1) Thorough training in fighting on foot must be given; at night, in all sorts of weather and all seasons, and over diversified terrain.

(2) All types of firing, especially at snap targets, must be practiced with both rifles and automatic arms, while the armored carrier is stationary and while it is in motion.

c. Fighting as Assault Troops

When the unit is used as assault troops, and also when fighting in woods, the weapons carried by the squads should be mostly submachine guns with plenty of HE and smoke grenades. Often only one machine gun will accompany the squad, but much extra ammunition will be distributed among several riflemen. The assault squads can borrow submachine guns from the other squads. The heavy machine guns may go into action without their heavy mounts, but the mount should always be available. Mortars, from the vicinity of the carrier, coordinate their fire with that of the heavy machine guns.

d. The March

Over favorable terrain, an average speed of 15 mph can be maintained, with a maximum speed of from 18 1/2 to 22 1/2 mph under favorable conditions. This would permit a total of 90 to 120 miles per day. The interval between the point section and point platoon is about a minute, and between the point platoon and the company, 2 minutes. Antitank weapons, if carried, should be placed well forward, but other heavy weapons are normally placed in the rear. The company commander, and the commanders and observers of the artillery and heavy weapon units, usually travel behind the point platoon. Each platoon provides its own flank guards. Every 2 hours, a 20-minute halt should be made for minor repairs and refueling.

e. Fighting from the Carrier

The chief weapon in fighting from the carrier is the fixed (light) machine gun. Generally, this will be fired during halts of 15 to 25 seconds.

f. Attack in Cooperation with Tanks

The company will usually follow close behind the tanks to mop up points of resistance the tanks have by-passed. The leading troops will not dismount from their carrier, but will leave the fighting on foot to the succeeding waves. Antitank guns, if allotted, protect the flanks. Close contact will be maintained with the tanks ahead.

g. Pursuit

Close pursuit will be maintained, with every effort made to get behind and cut off the enemy, but when doing this, care must be taken to avoid being flanked in turn.

h. Defense

In defense, the armored infantry provides the outguard.

i. Retreat

Against an enemy on foot, withdrawal is made under cover of the armored infantry, which launches delaying counterattacks. Against an armored force, strong antitank fire must be provided, with constant reconnaissance on the flanks.

j. Battle under Special Conditions

(1) Attacking Strong Prepared Positions

The first two of the four carriers of an assault platoon drive forward through gaps in the minefields under cover of fire from the heavy weapons, directed at the casemates. They take position at the rear of the enemy defense areas. Against enemy tanks, smoke is used.

In the third carrier is the assault platoon leader, with squads detailed to hack through or blow out a lane in the wire. The fourth carrier, at 100 to 200 yards distance, follows up with ammunition and equipment.

(2) Fighting for Rivers

A swift attack to cut fuse connections will often prevent the enemy from blowing up bridges. If resistance is encountered, the patrols must report to the commanding officer, who may decide to cross elsewhere by means of rubber boats, or otherwise. Diversions should be practiced to draw the enemy away from the place of actual crossing. As soon as a crossing is made, the armored infantry will protect the bridgehead. Care must be used to prevent the dispersion of forces, and until a bridge is built, personnel carriers remain under cover from possible artillery fire.

(3) Fighting in Darkness or Fog

Careful preparation is necessary. In order to maintain direction the attack is usually made on foot along the lines of roads, streams, or ridges. Every effort is made to keep the carriers well forward, but under cover, in case the fog lifts or daybreak comes.

(4) Fighting in Towns or Villages

As a rule, occupied towns are avoided. If necessary to attack them, setting fire to buildings will assist in making a breach in the defenses, and the attack is then pushed through courtyards and gardens rather than along streets.

(5) Fighting in Woods

Careful preparation and planning should be done when time permits. Where possible, the woods are split into sectors and cleared in detail. The thicker the woods, the closer must be the formations. Before crossing open spaces, close observation must be carried out. Cunning and surprise are often more profitable than prepared assault. At nightfall, the attack is broken off and the defense organized.

On the defensive, the position should be organized in depth well inside the edge of the woods. Trails are cleared and marked for rapid communication within the position. Listening posts near the edge of the woods keep the open country under observation; they are frequently relieved.

7. AMMUNITION CARRIED BY GERMAN TANKS

Two captured German tanks (Pz.Kw. 3's) were recently examined in the Middle Eastern theater. The number of rounds carried for the 50-mm (1.97-in) guns was as follows:

	HE	AP	TOTAL
Tank 1	80 (45%)	98 (55%)	178
Tank 2	51 (32%)	111 (68%)	162

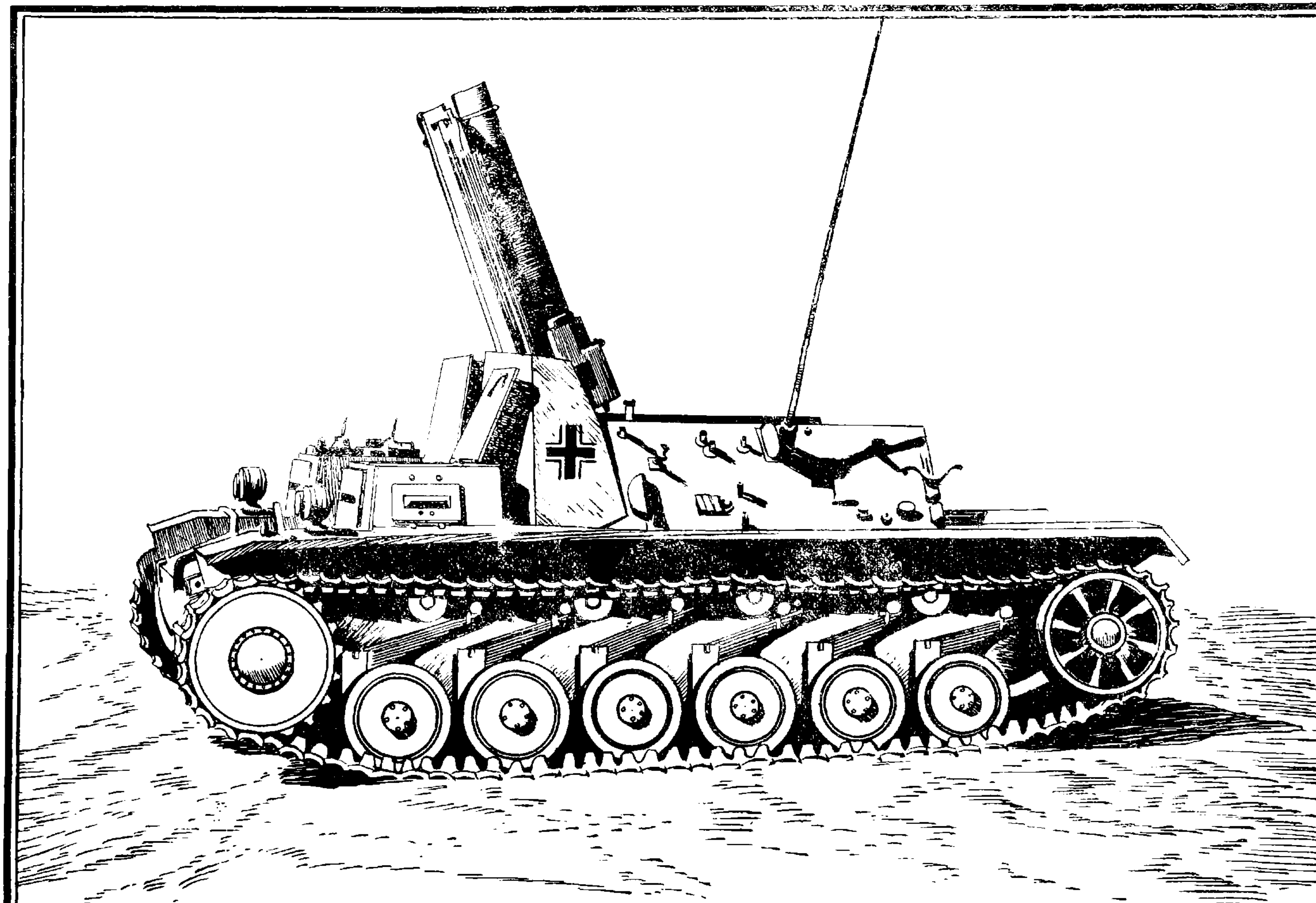
Of these, 86 rounds were carried loose on the floor of Tank 1, and 83 in Tank 2. In the bins of the first tank were 92 rounds, and there was room for 7 additional rounds; in the bins of the second were 79 rounds with room for 17 more. This indicates a total stock of some 185 and 179 rounds per tank, respectively.

ARTILLERY

8. GERMAN 150-MM SELF-PROPELLED GUN

The Germans have at least three types of 150-mm self-propelled guns. One is mounted on the chassis of a German Pz.Kw. 1 and has a high three-sided shield. Another is mounted on a French tracked-chassis (see Tactical and Technical Trends, No. 12, p. 15). The third type has already been described in some detail in Tactical and Technical Trends (No. 8, p. 28, and No. 13, p. 6). Photographs of the latter are now available and are the basis of the accompanying sketch.

The sketch shows that the gun is mounted on what is apparently an adaptation of a German Pz.Kw. 2 chassis; the standard Pz.Kw. 2 chassis has 5 bogie wheels, whereas the mount for this 150-mm gun has 6 bogie wheels.



GERMAN 150-MM SELF-PROPELLED GUN

Otherwise the mount appears similar to the usual Pz.Kw. 2 chassis. It was previously reported that the maximum elevation for this weapon was 30 degrees; in the sketch the gun is elevated to an angle of about 70 degrees, but whether it can be fired from this position is not known. Presumably, radio communication is installed, as there is a rod-type aerial on the left hand side of the superstructure.

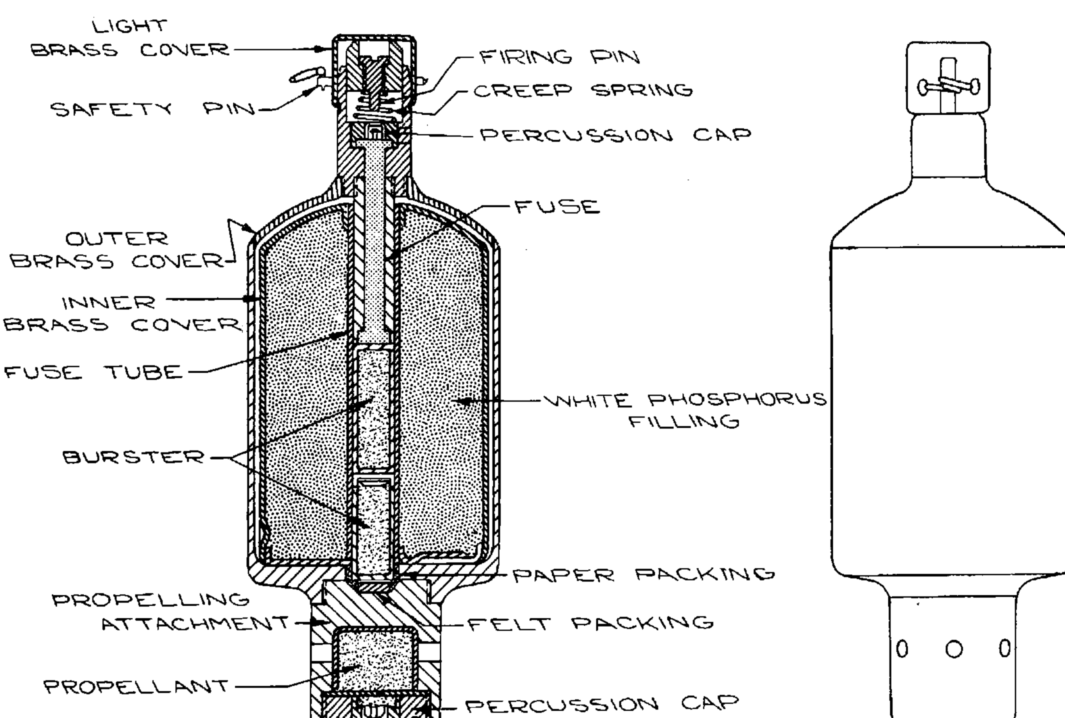
CHEMICAL WARFARE

9. THREE JAPANESE INCENDIARIES*

Aside from incendiary bombs, the Japanese are reported to have at least two types of incendiary grenades and at least one type of incendiary mortar shell. For general information on Axis incendiary munitions, see Tactical and Technical Trends, No. 14, p. 12.

a. Half-kilogram Incendiary Grenade

This grenade, 50-mm in diameter, approximately 5.3 inches in length, and



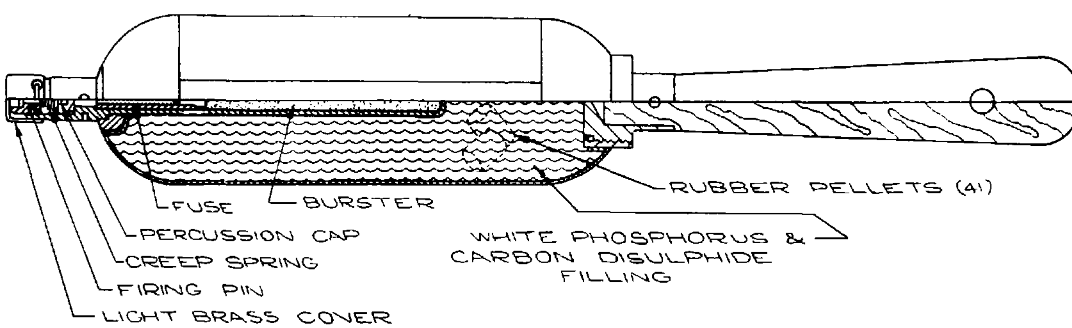
*Based on a Chemical Warfare Intelligence Bulletin, Office of the Chief, Chemical Warfare Service.

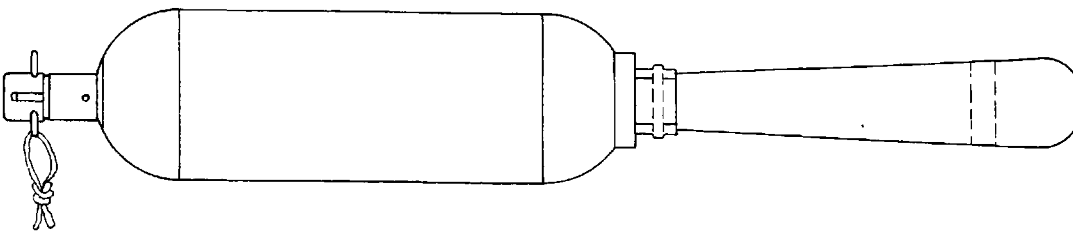
weighing 1.1 pounds, may be thrown by hand or projected with a heavy grenade discharger, sometimes mistakenly called a "knee mortar." The incendiary filling (white phosphorus) is contained in a brass body. An attachment consisting of a propellant and a percussion cap is screwed into the base of the grenade for projection with the grenade discharger. When thrown by hand, this attachment is removed. Before use, the safety pin is withdrawn. The safety pin serves the double purpose of holding a light brass cover in place and of preventing downward movement of the firing pin onto the percussion cap. The firing pin is then held off the percussion cap by a creep spring, upward movement being prevented by the light brass cover which is crimped in the middle and engages in a "V" groove cut around the ignition tube.

When used by hand, the head of the ignition tube is given a sharp tap to drive the firing pin onto the percussion cap. After a delay of 4 to 5 seconds, a fuse detonates the burster, scattering the phosphorus. When used with the grenade discharger, the shock of discharge has the same effect as tapping the grenade when thrown by hand.

b. Incendiary Hand Grenade

This weapon has a diameter of 2.2 inches and an over-all length of 13.5 inches, including the wooden handle 5.3 inches in length.





The incendiary filling of the grenade is composed of white phosphorus and carbon disulfide with 41 cylindrical rubber pellets. Upon explosion, these pellets are scattered and bounce about, igniting any inflammable matter with

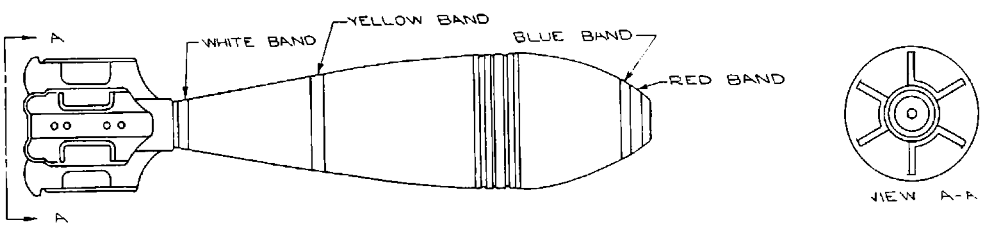
which they may come in contact.

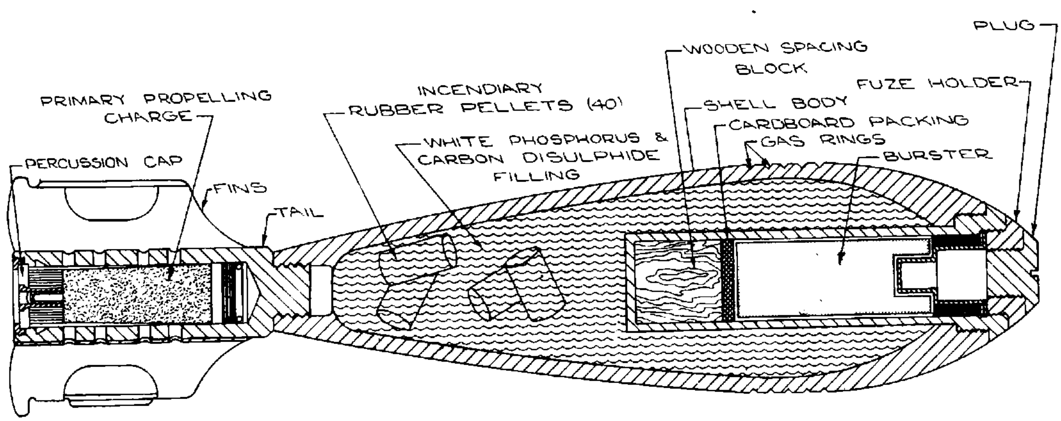
The detonating apparatus for this grenade is similar to that of the 1/2-kilogram incendiary grenade previously described, except that the fuse gives a delay of 6 seconds.

c. 90-mm Incendiary Mortar Shell, Type '94'

The incendiary filling in this bomb is similar to the hand grenade described in paragraph b. above, being composed of white phosphorus and carbon disulfide with 40 cylindrical rubber pellets.

The tail arrangement is designed for one primary and six secondary charges.





The total weight of the bomb is given as 11.6 pounds, the incendiary filling as 2.2 pounds, and the burster charge as 2.8 ounces, while the over-all length is 16 inches. Its maximum range is reported to be about 4,000 yards.

10. JAPANESE PERSONAL DECONTAMINATION KIT

a. Description

The decontamination package shown below is intended for use by the individual soldier in destroying liquid vesicants that may have come in contact with his skin. The package consists of a carrying bag or pouch, a can of decontaminating agent, and a roll of absorbent cotton. The decontaminating agent has been identified as 17.8 percent sodium beta naphthalene sulfonchloramide and 82.2 percent clay. The active chlorine is 2.66 percent on the bone-dry basis. The active agent is apparently rather stable, as no corrosion was evident on the particular metal can examined. Decontamination is accomplished by mixing the agent with water and applying it wet to the skin with absorbent cotton. Approximately 45 grams (1.6 oz) of the decontaminating agent and 2.5 grams (0.09 oz) of the absorbent cotton are supplied. The can is of metal with a screw top and measures 3.1 by 2.3 by 1.2 inches. The carrying bag is of cloth, with cloth tie-strings and a fiber fob. The entire package weighs 95 grams (3.3 oz). The translation of the inscription (see sketch) on the front of both the bag and can is "Decontamination Kit."

b. Directions for Use

The label on the reverse side of the can gives instructions for decontamination, in substance as follows:

(1) As quickly as possible, tear off the absorbent cotton in the enclosed

package, a little at a time, and lightly blot or soak up the chemical which is present on the skin.

(2) Undo the screw top of the can and pour in some water. Close the opening with the finger, and shake. Use the contents while in a muddy condition.

(3) Spread the decontaminant over the skin and gently rub it in.

ENGINEERS

11. GERMAN WINTER FIELD FORTIFICATIONS, AND THE USE OF ICE-CONCRETE

From the Eastern Front comes a report of the German type of winter field fortification and shelters, with a description of an effective concrete made of a frozen sand, or sand with broken stone, and water mixture.

*   *   *

a. General

Construction of field fortifications in winter presents a number of special difficulties due to cold, frozen ground, ice, and snow which may occasionally reach a depth of several meters. The men's capacity for work is moreover lowered by extreme cold. For this reason allowance must be made for a considerable increase in time and personnel requirements, often amounting to many times the normal. Special tools and equipment suitable for work under winter conditions must be obtained well in advance.

The depth to which ground is frozen on the Eastern Front often reaches 1.5 meters (5 ft.).

b. Camouflage

In snow-covered terrain, special attention should be paid to concealment against ground and air observation. Paths caused by trampling, ditches, working sites, etc., can be recognized from the air with particular ease. For this reason, before beginning work snow should be cleared to one side so that it may be available for subsequent camouflage, and finished work must again be covered with snow. Trenches can be covered with planks, beams, pine branches, or sheet-iron, on which snow should be heaped.

c. Construction of Shelters, Trenches, and Breastworks

(1) Construction of Earth Shelters in Frozen Ground

(a) In the presence of the enemy, for speedy and silent preparation of shelters in frozen ground sandbags are used; for this purpose, canvas rather than paper sacks are to be recommended. Sandbags are filled in the rear, and carried forward to the point where they are to be used. Freezing sandbags by pouring water on them improves their protective properties for the duration of cold weather.

(b) Where the tactical situation permits unimpeded work, the following practice is adopted. In constructing trenches in ground which is not frozen to a great depth, in order to avoid the labor of digging through the frozen ground, the surface is divided up by furrows into the desired sections. These sections are then undermined, and the frozen crust is caved in and removed. For this work heavy pickaxes, crowbars, iron wedges, etc., are necessary.

Deeply frozen ground can be broken up by engineers using power drilling equipment (concrete breakers driven by portable compressors) and explosives. Holes for explosives can be made in frozen ground by driving in red-hot, pointed iron rods or crowbars. In excavating trenches in deeply frozen ground, the best method is to dig holes at an interval of several feet down to the full depth of the trench; these holes are subsequently connected by tunnels under the frozen surface, and finally the surface is caved in.

(2) Construction of Shelters in Snow and Earth

If the depth of snow is great, fieldworks must be constructed partly in snow and partly in the ground. Small shafts are sunk to the full depth, planned and are then connected by trenches dug in the snow. The deepening of these trenches into the ground can be carried out later. If there has been only a short frost before the snowfall, the ground will be found to be only slightly frozen, since the snow acts as a protective layer against hard freezing.

(3) Construction of Shelters in Snow

If heavy snowfall is to be expected, or if time is short, or if equipment for excavation of frozen ground is not available, breastworks of snow can be erected on the surface. Snow, if it is to be used as protection against enemy fire, must be tamped solid. It must also be camouflaged by scattering loose snow over it. Its effectiveness as a protection is raised by pouring water over it. The rear side of the breastwork should be revetted with sandbags filled with snow; canvas rather than paper should be used for this purpose. Alternative materials are round timber, wire netting, or wooden planks secured to posts, like a fence.

If it is impossible to drive in or anchor the posts, simple trestles of triangular cross section should be erected at intervals of 5 to 6 1/2 feet, as shown in figure 1. The best practice is to carry the trestles ready-made to the site

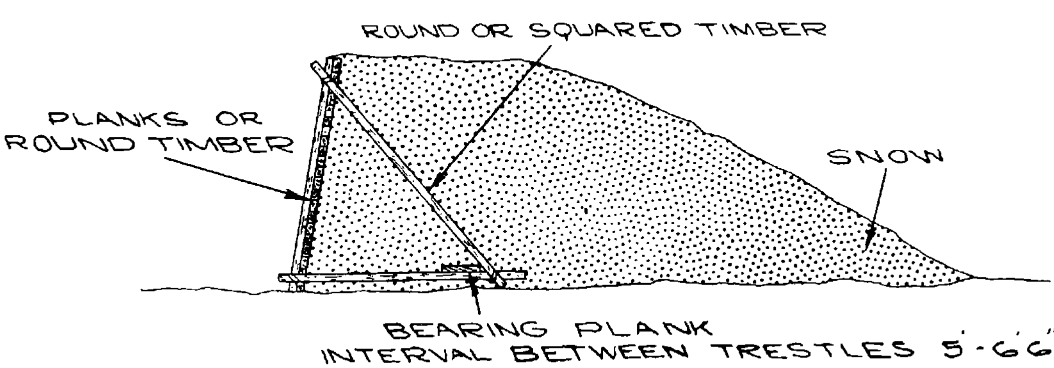


FIG. 1

where they are to be used. After adding the revetment and bearing planks, snow is shoveled over it and tamped hard. The center of the snow wall can be formed

of any other suitable material: e.g., round timber, stones, gravel, sand, etc.

(4) Protective Qualities of Snow and Ice

The following are the thicknesses of snow and ice which afford protection against ordinary rifle fire, but NOT against fire concentrated on a single point:

New snow	(minimum) 13 ft
Tamped snow	(minimum) 8 - 10 ft
Frozen snow	(minimum) 6 ft 6 in
Ice	(minimum) 3 ft 3 in

(5) Covered Trenches

Trenches can be covered over to protect them from snowing-up, and to conceal them, as shown in figure 2. The cover of round timbers, sawn timbers, planks, or beams must be strong enough to carry the maximum weight of snow that can be expected.

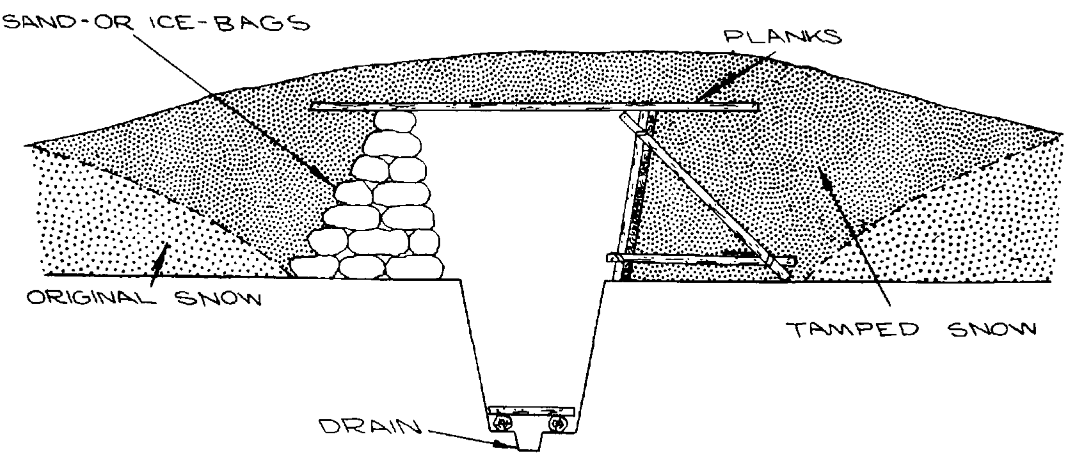


FIG. 2

d. Tunneling in Snow

If the snow is sufficiently deep, tunnels can easily be constructed. They do not provide effective protection against artillery fire, but this disadvantage is considerably outweighed by the complete concealment they afford. The method of construction varies according to the condition of the snow, which may be new (powdery), already frozen, and of varying depths. The following are the methods employed:

(1) Digging in from the surface and covering over with planks and layers of snow;

(2) Digging in from the surface and the construction of sheeting or revetting with planks, beams, brushwood, or sheet-iron;

(3) Underground tunnelling, construction of wooden sheeting or revetting with planks, beams, or brushwood (figure 3);

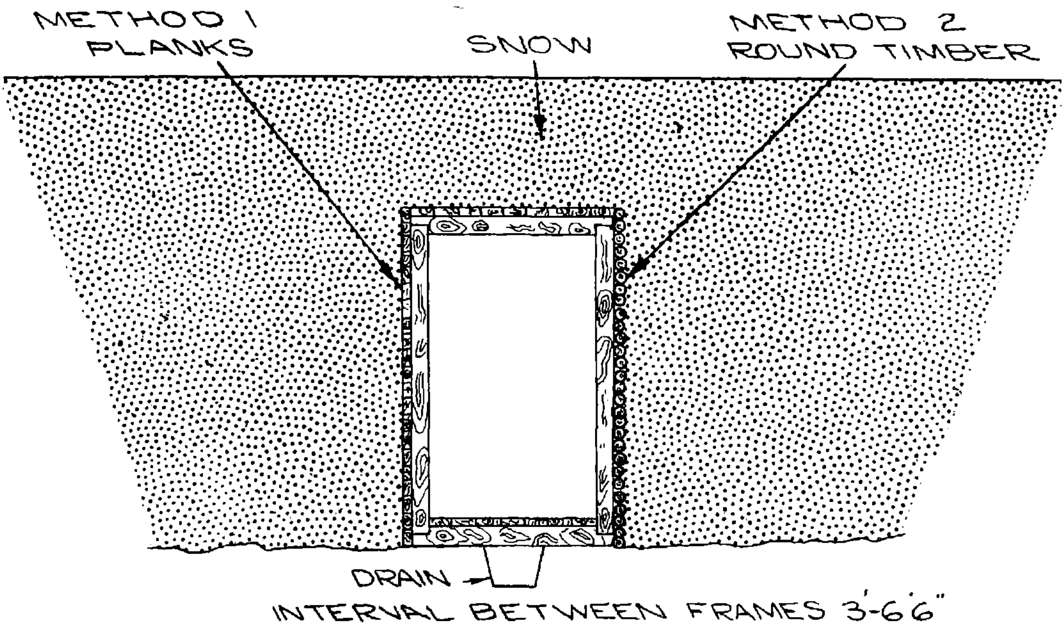


FIG. 3

(4) The construction of tunnels without sheeting (figure 4). In long tunnels, ventilation must be provided by ventilation shafts, as shown in figure 5.

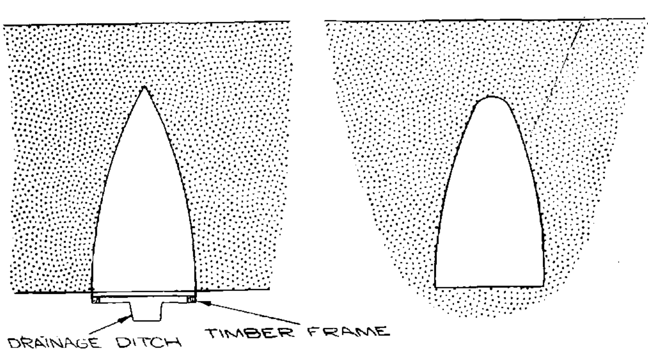


FIG. 4

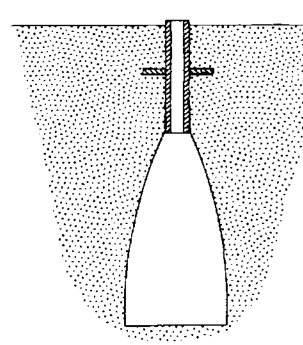


FIG. 5

e. Construction of Shelters, Covered Positions, Positions for AT or Infantry Guns, and Ammunition or Supply Shelters

The same methods are used as in construction in the ground. The floor and walls should be constructed with particular care, and the roofing formed of planks or beams. In addition, roofs and walls must be covered with roofing felt, which should also be laid under the floor. Inner insulation must also be provided by mats and straw, layers of wool, or sacking, and cracks should be filled with moss, sod, or straw. Another effective method of building walls is to use a double revetment of planks with a heat-insulating space between them. The revetment of intermediate space is necessary not only as protection against cold, but also to avoid the melting of the snow by internal heating stoves, etc. Doors and entrances should be small and well fitting. Even if shelters are unheated, a snow covering of sufficient thickness will raise the temperature in shelters of this kind to 3 to 5° C (37 to 41° F). Owing to their slight insulating properties, sheet-iron side walls are suitable only for excavations which are not to be occupied by personnel.

f. Drainage

When a thaw sets in, special provision must be made for draining away water, and this should be provided, when the position is first constructed, by ditches and other methods. Crawl-trenches and tunnels must be built with a gradient sufficient to drain the water away. Failure to observe these precautions will quickly result in the flooding of the excavation and the caving-in of the weakened and undercut walls.

g. "Ice-Concrete"

(1) Definition

Ice-concrete is a dense, frozen mixture of sand and water, or sand with gravel or broken stone and water.

(2) Application

Ice-concrete is especially suitable for reinforcement of breastworks and for the construction of roofs and shelters. An example is shown in figure 6 on the following page. Ice-concrete can be protected for a considerable period against effects of rising temperature by being covered with earth.

(3) Strength and Composition

Ice-concrete is many times stronger than normal ice. Regarding its composition, experience is as follows:

(a) A high proportion of fine sand increases the strength. The strongest mixture of all is composed of sand alone.

(b) If insufficient sand is available, gravel or broken stone can be used. The proportion of fine sand should, however, not fall below 10 percent.

(c) A small proportion of topsoil, clay, or mud is not injurious.

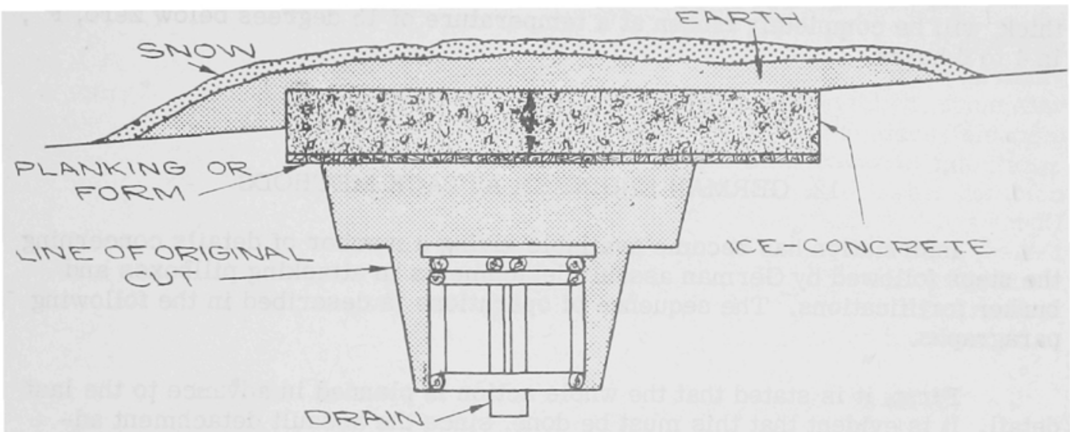


FIG. 6

(d) Only as much water should be added as the mixture is capable of absorbing, and as will cause it to become slightly liquid.

(4) Preparation of Ice-Concrete

(a) In preparing the mixture by hand, it is shovelled over, if possible in a trough, and the water added gradually; or, mixing can be done in a concrete mixer. The wet mixture is immediately poured into the forms. This operation is carried out in layers of from 4 to 6 inches, accompanied by tamping, in order to consolidate the mixture.

If gravel is used, the material is pre-mixed without adding water. The mixture is then poured into the forms in layers 4 to 6 inches thick, and water is poured in to complete saturation, accompanied by stirring and tamping.

(b) In both cases successive layers should be added as soon as the previous layer is beginning to freeze. Freezing takes place more slowly if the water is added later. In order to hasten the process of freezing, sand and gravel should be already at a freezing temperature before water is added, and the water itself should be as cold as possible. If the material is frozen in large lumps, it should be broken up before mixing.

(c) Ordinary wooden forms should be used, but snow, ice, earth, straw, or brushwood can also be used for this purpose.

As a protection against warming from inside (i.e., heating by stoves, etc.), the inner forms are left standing. The outer forms should be removed as soon as possible in order to hasten freezing.

(d) As a guide, it may be noted that a sheet of ice-concrete, 4 inches thick, will be completely frozen at a temperature of 13 degrees below zero, F^{o}, in 4 to 6 hours.

12. GERMAN ENGINEER ATTACK METHODS

Information has become available giving a number of details concerning the steps followed by German assault detachments in attacking pillboxes and bunker fortifications. The sequence of operations is described in the following paragraphs.

First, it is stated that the whole action is planned in advance to the last detail. It is evident that this must be done, since the assault detachment advances very closely behind the artillery barrage directed on the point under assault.

The initial step in the assault is to utilize heavy artillery fire to form craters in the area in front of and behind the barbed-wire entanglement; the assault troops then advance, taking advantage of these craters until they reach the barbed-wire entanglement. At that time, a green Very light is fired, and this is the signal to advance the artillery fire in order to localize it more on the pillbox or bunker under attack. This forces the defenders to keep the embrasures fairly well buttoned-up and gives the attackers a chance to clear a path through the barbed wire.

The leading elements of engineer troops, who have advanced up to the barbed wire, then push forward their bangalore torpedoes and signal "Ready for ignition." When all the bangalore torpedoes are in place, the leader of the assault detachment signals "Ignite all together." Ignition is then completed as nearly simultaneously as possible. The man responsible for each ignition signals "Ignited" when his job is done, and then retires some 5 yards or more to cover. Generally the laying and firing of the torpedoes takes place under a smoke screen created by smoke grenades to prevent the enemy from observing the action at the wire entanglements.

Once the wire has been breached, the leader signals "Detonation has taken place, gap here"; the leader, followed by the assault detachment, then rushes through the gap in the wire. At this point it becomes more than ever necessary to prevent the defenders from firing on the assault troops. This is accomplished by delivery of artillery or antiaircraft direct fire at close range against the embrasures to force the defenders to keep the embrasures closed.

Artillery fire is also put down behind the pillbox to prevent the defenders from emerging. Smoke is also used to mask the pillbox in order to further reduce the visibility of the defenders. The flame-throwers, who have been following up the leading detachment, now move forward to within about 5 yards of the pillbox and attack the embrasures; this forces the defenders to close completely the embrasures, or to desert them. At this time the demolition squads fix their pole charges, and at the signal of "Last jet" from the flame-thrower, they rush forward and place their charges against the embrasures, after which they signal "Ready to ignite." The leader waits until all demolition charges are reported in place and then signals "Ignite." This is done,and the entire detachment takes cover. As soon as the embrasures have been blown in, men are detailed to guard them so that no one can escape.

As soon as the pillbox has been silenced and occupied, a signal "Mission accomplished" is given.

13. ANTILIFTING DEVICE FITTED TO FRENCH ANTITANK MINE

During the British Eighth Army's advance, French antitank mines fitted with an antilifting device were encountered. The device consisted of a German-prepared demolition charge fitted with a pull-igniter connected from beneath to the mine pressure-plate.

INFANTRY

14. GERMAN PATROLS IN NORTH AFRICA

The following items of information on certain German patrols in the El Alamein area have been obtained.

The patrols in question occurred at regular intervals of 4 days, the men being drawn from the various platoons in the company. At no time was a complete squad or platoon as such detailed for a patrol. One patrol consisted of 16 to 18 men under a platoon commander. The men were formed into two squads, and only the squad leaders were told the plans for the patrol. They left their main line of resistance and went out 1,500 to 2,000 yards in front of their minefields, in single file. Five or six men stayed behind to guard the gap through the minefield.

On another patrol, the covering party consisted of an NCO and six men armed with one machine gun, one Tommy gun, and hand grenades. A third patrol consisted of the equivalent of two platoons under the command of a company commander.

Neither telephone nor portable radio set was taken on these patrols, and no artillery officer accompanied them.

15. GERMAN USE OF AIRCRAFT FOR GROUND SECURITY AT NIGHT

On two occasions at night, British ground patrols in the El Alamein area observed a German Fieseler Storch take off and circle around them firing its machine guns. It has been suggested that this may be a method of ascertaining the strength of hostile patrols and ensuring ample warning if an attack in force is under way.

Comment: This is a small German plane comparable to the U.S. liaison plane. It can take off and land in very limited space and is used for liaison, courier service, observation, and similar tasks. Division and higher commanders sometimes use it for reconnaissance and as a means of transportation.

16. JAPANESE TACTICS IN NEW GUINEA

The following is a brief note on Japanese land tactics in the Milne Bay area (southeastern New Guinea). It also touches on their treatment of their own wounded.

* * *

When the Japanese met our line of skirmishers,they fired all their machine guns into the tree-tops above our men. As soon as this fire was

countered by our machine guns, their mortars opened up on our machine-gun positions.

On several occasions, when our line of skirmishers was met, large numbers of Japanese ran forward and were met by withering machine-gun fire. They immediately turned and fled. Our men, with the usual cry of "After the bastards," rushed after them with fixed bayonets. Immediately, the fleeing Japanese threw themselves on the ground and our troops ran into machine-gun fire from the Japanese rear.

In the Milne Bay area, the Japanese plan was to advance and attack during the night and then to withdraw during the daytime, leaving dozens of their men at the top of coconut palms and in the jungle, with machine guns and Tommy guns. As our forces advanced the next day, they were harassed by these remnants. Often the Japanese were tied in the tops of palm trees and remained there after they were shot. (The Japanese practice of advancing at night and hiding during the day may have been dictated on the spot by the constant strafing and reconnaissance by Allied aircraft.)

The plan eventually developed by our own forces as they advanced during the day was to drop a platoon or two each 400 or 500 yards as they advanced; eventually, they would meet the main Japanese forces. By nightfall each of the independent units and our main force would slash a perimeter clearing of about 200 yards' diameter around their positions, rig trip wires at the edge, and then confidently await the Japanese night attack. This appeared to upset the Japanese plan and proved very successful.

Considerable numbers of the Japanese wounded were evacuated by warships, but a number of cases were found of badly wounded men who apparently were considered not worth removing, having been shot through the heart by their own troops.

17. SOME PRINCIPLES FROM THE WAR ON THE RUSSIAN FRONT

Although Germans introduced "Blitzkrieg" tactics, to a great extent they themselves evolved the tactical countermeasures to this form of attack. The Russians, who have fought two major defensive campaigns, have been quick to seize, adapt, and even improve on the defensive tactics employed by the Germans in the winter of 1941-42.

a. Anti-Blitz Defense

As a result, the effective defensive measures as developed by both sides are principally represented by:

(1) The "Hedgehog" system of all around defense in depth based on effective use of any ground, and especially of villages and towns, protected by mine-

fields, and garrisoned by determined troops with a coordinated fire plan.

(2) The rapid conversion of strategically important inhabited localities into modern fortresses with every street and house an actual strongpoint.

(3) The use of night fighting, in order to give the advancing enemy no rest.

(4) Rapid improvement in means of antitank defense.

(5) Improved disposition and employment of reserves and the better timing of determined counterattacks.

(Note: Dive-bombing, and parachute and glider action, have ceased in themselves to exercise a decisive influence against a well-disciplined and organized defense.)

b. New Offensive Tactics

The problem facing the attacker has been to evolve new offensive tactics and thereby regain for the offensive that decisive preponderance which it had lost for the moment.

The most promising developments so far evolved by both Russians and Germans may be summarized as follows:

(1) Night Fighting

If the enemy can be made to fight night and day without respite, a decisive result may be obtained in a particular sector. The Russians, as soon as they discovered that night fighting caused the enemy particular discomfort, concentrated on this form of warfare. Infantry and engineers are best adapted for these tactics; tanks either provide a diversion or follow the infantry to gain favorable positions for the following day's battle.

(2) New Methods of Coordinating Tank and Infantry Action

Tanks carry or haul heavily armed infantry and engineers to prepare and to hold ground, and to neutralize the antitank defense. (This can be done where there is no undue exposure to small-arms fire.)

(3) Concentration of Effort

Great emphasis is placed on bringing all available fire power to bear simultaneously at the point of maximum effort, thereby causing changes in the doctrine of deployment. The doctrine of deployment by echelon, which does not permit this heavy, simultaneous concentration of fire power, is being abandoned; this doctrine also leads to wastage without any positive returns for casualties suffered.

(4) New Supply Methods

Improved methods are used to supply advancing troops with essentials by air and by armored vehicles.

(5) New Artillery Tactics

Creeping and box barrages are considered ineffective and a waste of ammunition. The barrage is only important in screening friendly troops from counterattack while consolidating newly won ground. Artillery support is based primarily on highly mobile control of artillery fire in close support of tanks and infantry. A large proportion of guns is self-propelled. The air arm is employed in the role of long-range artillery and for strafing reserves, dumps, and lines of communication.

(6) Greatly Increased Infantry Fire Power

This is accomplished principally by increasing the basic allowance of mortars, automatic weapons, and antitank rifles. The number of mortars particularly, and their massed use, have been greatly expanded.

(7) The Employment of Shock Groups

Their composition and armament are highly elastic, but both sides consider they are essential to achieve a decision at the point of maximum effort. The Russians seem to have shock groups organized in special brigades, or even as special shock armies.

(8) The Achievement of More Effective and Mobile Control in Battle

This is accomplished to a certain extent by greater use of aircraft by senior staff officers and commanders, both for reconnaissance in the planning stages and to control operations.

(9) Improvisation and Development of Weapons

Although no really new weapons have been introduced, there has been considerable development in the use of weapons, and the side which is capable of the more rapid improvisation scores an advantage. Thus, the campaign has seen the development of the rocket gun, the multiple grenade projector, the multiple-barreled rocket projector, and rapid increase in the caliber of antitank rifles and of antitank and tank guns.

c. Important Factors

The important factors which appear to have assisted the Russians to keep up in this keen competition for tactical superiority are:

(1) A centrally controlled and adaptable industry which can provide

rapidly improvised weapons to meet or surpass the enemy's latest technical improvement.

(2) Intense and continuous training in the latest tactical innovations and ruses--night fighting especially requires very extensive and concentrated training.

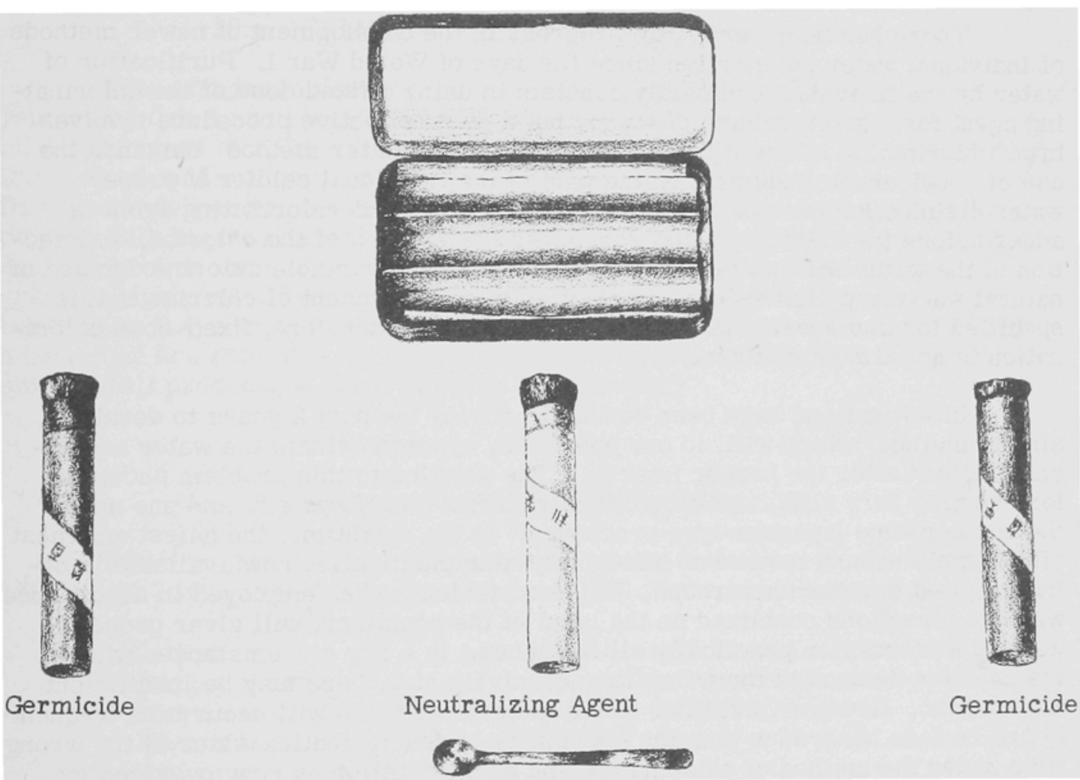
(3) Elasticity of tables of organization and basic allowances to meet changing battle requirements.

MEDICAL

18. JAPANESE WATER-PURIFICATION KIT

a. Description

The Japanese water-purification kit shown below is intended for use in rendering water found in the field fit for human consumption by chlorinating and destroying harmful bacteria. The kit consists of two vials of "germicide" (the chlorinating agent), one vial of neutralizing agent, a small aluminum spoon, and a metal box with a hinged lid.



The chlorinating agent is composed of a mixture of calcium and sodium hypochlorites; active chlorine content is 7.05 percent. The neutralizing agent, used to destroy the chlorine, is sodium thiosulfate. The vials of germicide contain about 5 grams (0.18 oz) of the agent, while the vial of neutralizing agent contains 5.3 grams (0.19 oz). The cork ends of the vials are dipped in paraffin wax for protection of the contents. The metal box measures 1.75 by 0.6 by 3.4 inches and is fitted with a cardboard liner to protect the glass vials.

b. Directions for Use

A label pasted to the top of the box gives the following directions for use:

(1) Put one spoonful of the germicide into a flask (about 1 quart) full of water. Insert the cork and shake well for about 5 minutes.

(2) After a further 5 to 10 minutes have elapsed, add one spoonful of the neutralizing agent and shake.

(3) Wipe the spoon thoroughly after using.

Comment: The spoon holds from 3 to 4 grains and a single kit can therefore be used from 15 to 20 times.

There has been very little progress in the development of newer methods of individual water purification since the days of World War I. Purification of water by the individual ordinarily consists in using a fixed dose of the chlorinating agent for a given volume of water, but a more effective procedure involves hyperchlorination followed by dechlorination. The latter method demands the use of considerable judgment on the part of the individual soldier if proper water disinfection is to be accomplished, since if the dechlorinating agent is added before the chlorine, or too soon after the addition of the chlorine, disinfection of the water will not take place. Because of the variable chlorine demand of natural water supplies encountered in the field, the amount of chlorine that is specified for some water is insufficient for others; therefore, fixed-dose chlorination is not always satisfactory.

Investigations have been conducted during the past 2 years to develop a simple method which will, in one operation, hyperchlorinate the water and dechlorinate it after the proper interval. The solution to this problem should be forthcoming very soon, and should furnish a fool-proof system, and one unlike the cumbersome Japanese-type procedure. In the meantime, the safest and most efficient all-around method of individual water purification now available is being supplied to American troops. Halazone tablets, when employed in accordance with the directions contained on the label of the container, will giver proper water disinfection in practically all instances. In a few circumstances where the chlorine demand of the water is excessively high, there may be insufficient disinfection. However, evidence would indicate that this will occur less frequently and be less hazardous than the possibility of dechlorinating water at the wrong time under the method of chlorination and dechlorination as now practiced by some armies.

ORDNANCE

19. INTERCHANGEABILITY OF PISTOL AMMUNITION

It is now known that ammunition of the 9-mm Italian pistol Model 910 (Glisenti) is interchangeable with all standard types of German Luger (Parabellum), pistol and submachine-gun ammunition. These Italian cartridges may be recognized by the bullet, shaped like a truncated cone. British 9-mm ammunition for the British Sten & Lanchester submachine gun will function in German and Italian 9-mm weapons that use the above ammunition.

20. GERMAN 150-MM INFANTRY HOWITZER

This standard infantry horse- or motor-drawn support weapon, will reportedly fire a shell weighing about 85 pounds, either HE or smoke, with a minimum range of 1,012 yards and a maximum of 5,140 yards. The ammunition is not fixed, and six types of charges are used. Either low- or high-trajectory fire can be delivered, the velocity and trajectory depending on the charge employed. Silk bags contain the powder, with a rimmed brass cartridge case to seal the breech and carry the percussion primer. Operating on impact or graze, a highly sensitive nose-percussion fuze gives either an instantaneous burst or an 0.4-second delay. While no details of a concrete-piercing shell with a base fuze are available, it would seem probable that one may be issued. The smoke shell produces a cloud 55 yards in diameter.

21. GERMAN LONG-RANGE 172-MM GUN

From the Middle East, unconfirmed details are reported of a 50-caliber, 172-mm (6.7 in) gun with a range of over 30,000 yards, as follows:

Caliber	172.5 mm (6.79 in)
Length of bore	50 calibers (approx)
Muzzle velocity	1,970 - 2,300 f/s
Maximum range	30,520 yds
Traverse - on platform	360°
Traverse - on carriage	16°
Elevation	70°
Weight of shell	140 lbs (approx)
Ammunition	Percussion, or time fuze
Rate of fire	1 rpm
Gun detachment	12
Weight in action	16 1/2 tons

Normally the gun and carriage are separated for transport, but they have been towed complete by an 18-ton half-track vehicle.

QUARTERMASTER

22. A 550-POUND "FOOD BOMB"

A further development of the "food bomb" technique (see <u>Tactical and Technical Trends</u>, No. 20,p. 30) indicates that the Germans are now using airplane food-containers of 250 kilograms (550 pounds)--much heavier than the 30-pound containers previously noted. Me-109 fighters are apparently envisaged for use in dropping supplies to army units cut off during operations.

To feed such isolated groups, the Me-109 (E, F, and G models) when fitted with bomb carrier EPC 500,* can drop the food container. The container, when in position, clears the ground by only 38 inches. To avoid damage when taxiing on a bad field, it should be suspended in the bomb rack at the take-off only. The maximum speed at release is 215 mph, and the most favorable height from 500 to 1,000 feet. It would appear that there is a delay device for the release of the parachute.

23. ENEMY FUELS EXAMINED

<u>Tactical and Technical Trends</u>, No. 20, p. 26, gave an analysis of some samples of gas and oil used in German mechanized vehicles. It is evident from the following report that the enemy continues to maintain a high standard for gasoline and other fuels.

a. <u>Aviation Gasoline</u>

There are still two chief types of fuel in use in the Luftwaffe: viz., B. 4 ("blue," generally used in bombers) and C. 3 ("green," used in fighters).

During the last year, there has been no fundamental change in the quality or method of production of the blue-type fuel. The base spirit is of petroleum origin. If it emanates from current Axis production, it probably comes from Rumania. It is understood, however, that the quantities involved do not preclude the possibility of its derivation from pre-war or captured stocks of American or Venezuelan aviation gas.

It is blended to 90-octane by the addition of mixed high-octane gasolines, aromatics or hydro-gasoline, and T.E.L. (tetra-ethyl-lead). A previous conclusion that usually two of these blending agents (and T.E.L.) are used in conjunction has been confirmed. It has been suggested that the added high-octane gasolines come from captured stocks, and this is a possible explanation of the small concentrations used.

The reason for the continued use of blue fuel is not yet clear. There is no evidence of any increased use of hydro-gas--if anything, the reverse is true.

*Bomb carrier for 500-kilogram bomb.

Evidence strengthens the view that the C. 3 green fuel is capable of giving very high performance, and that it has an exceptionally good rich-mixture performance, considerably better than 100-octane aviation gasoline.

The origin of the aromatics in the green fuel is not certain, but the possibility of making them by the treatment of hydrogenation products from creosote has been established.

The method of preparation which most closely fits the analysis of this green fuel is the blending of a light cut of straight-run petroleum spirit with gasoline or naphtha, produced from creosote by some form of aromatising hydrogenation, and with the addition of high-octane materials.

All German aircraft fuels continue to show the presence of about 5.5 milliliters of T.E.L. per imperial gallon.

b. Motor Fuels

The test results on motor fuels from Europe, as well as other information available, suggest that T.E.L. is not being used, but that alcohol is being employed to a limited extent. A number of samples from the Middle East contained T.E.L.; others contained alcohol. A fair proportion of both sets of samples from Europe and the Middle East contain a high percentage of aromatic hydrocarbons, indicating that there is no general shortage of aromatics in Germany.

Octane numbers vary widely, and from the very low antiknock value of some of the motor gasolines captured in the Middle East, it would appear that local blending with benzol, alcohol, and/or T.E.L. must take place.

c. Other Fuels

The high-speed diesel-fuel samples from Europe are all of low pour-point, some as low as minus 40° C; it is suggested that a number contain Fischer-Tropsch gas oil (probably a special process for mixing gas oil) mixed with creosote. The low pour-point indicates that extensive provision has been made for dewaxing. On the other hand, some high-speed diesel-fuel samples from the Middle East are of much higher pour-point, showing that the enemy may have segregated them according to the type of climate in which they are to be used.

Several fuels appear to be of Rumanian origin, while one may be Persian. For heavy bunker fuels, coal tar products are being used in some cases.

24. GERMAN EMERGENCY SIGNAL CONTAINER AND FLARE PISTOL

The Notsignalbehalter, or emergency signal container, is a watertight semicircular case which can be carried by means of a one-half-inch leather or web strap. The case is made of thin sheet iron, and the cartridge holder inserts are made of sheet aluminum. The pistol contained in it is made either of aluminum or an aluminum alloy. Each container has in it one flare pistol, 10 red-star signal flares, 7 green-star signal flares, and 7 white-star signal flares. In the particular container examined there were three semicircular cartridge holders (only one shown in accompany sketch) and one flat cartridge holder (not shown in sketch). There were six cartridges in each holder.

The emergency signal container has been observed being carried by German parachute, air, foot, and tank troops. It is a very neat and compact unit which, besides being watertight until time of use, is very light in construction.

The total weight of the entire unit is 8.04 pounds. The following is a breakdown of the weights of the container and various components:

Entire case	8.04 lbs
Case without cartridges	2.70 lbs
Semicircular insert with cartridges	1.10 lbs
Flat insert with cartridges	1.00 lb
Live individual cartridge	0.16 lb (approx)
Expended cartridge	0.05 lb
Pistol	1.58 lbs

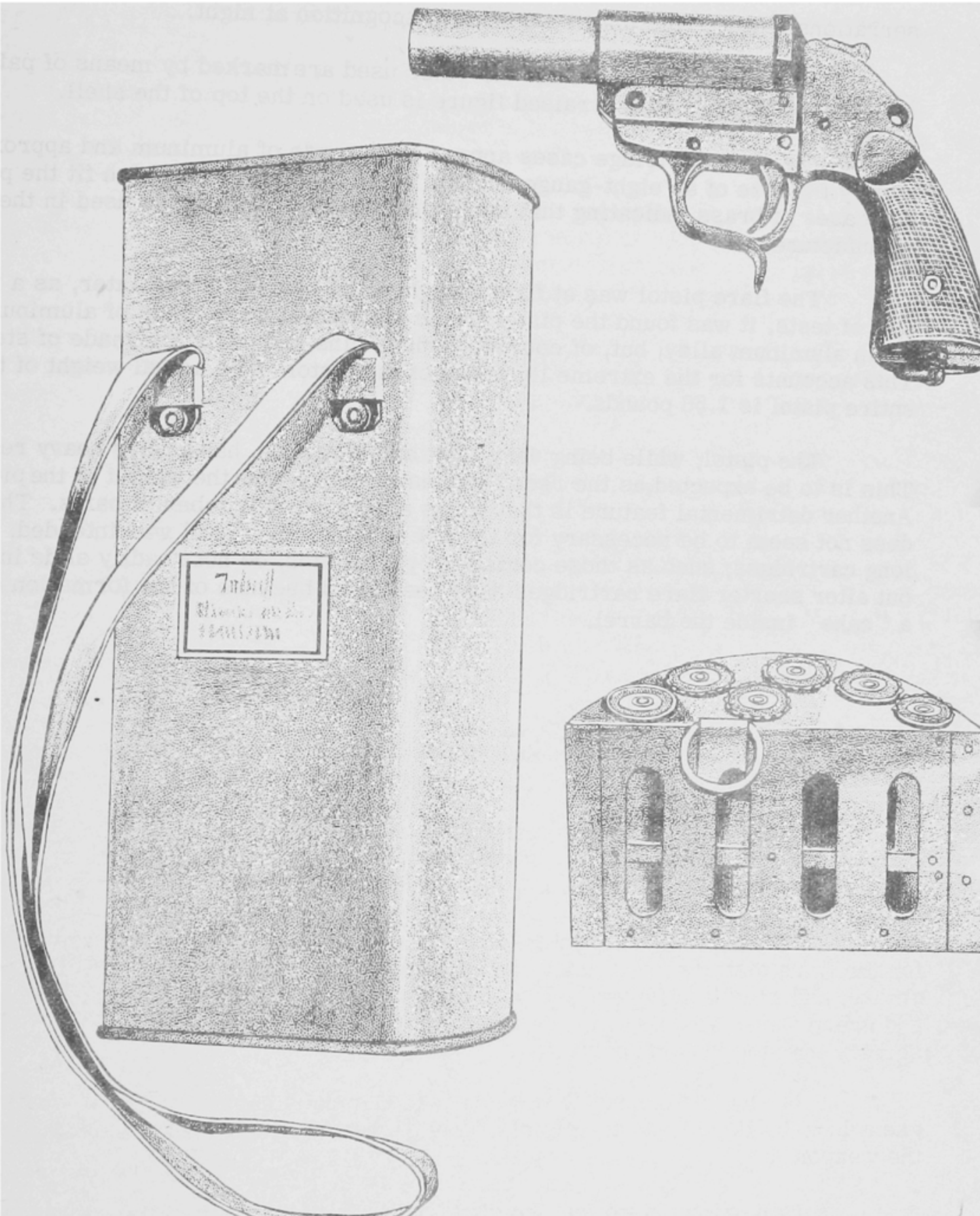
The weights of the individual cartridges varied from 0.15 to 0.18 pound for the different colored flares. An approximate weight is therefore taken.

The container is of a semicircular shape, approximately 13 inches high and 7 3/4 inches wide. It is approximately 4 inches from the flat side of the container to the center of the opposite curved side.

Besides the regular ones, a wide variety of additional flares are available for the flare pistol; they consist of parachute, high-burst, low-burst, yellow smoke, and whistling flares, and four blue streamers. The regular red, white, and green flares are also manufactured in cartridges approximately 3/4 inch shorter than the regular cartridge.

It is also of interest to note that the Germans have designed a small grenade to be fired from the pistol. This serves to illustrate the versatility of the weapon.

A rather important feature of the red, white, and green flares was the method of identification. The color of the flare is painted on the base and end, and also on a strip around the cartridge just above the base. In addtion, for purposes of night identification, the red flare has a base serrated completely around, the white flare has only half the base serrated, and the green has no



GERMAN EMERGENCY SIGNAL CONTAINER AND FLARE PISTOL

serrations at all. This makes for ready recognition at night.

Flares of other colors and for other used are marked by means of painted stripes and bands. Also, a raised figure is used on the top of the shell.

The flare cartridge cases appear to be made of aluminum and approximately the size of an eight-gauge shotgun shell. Other flares which fit the pistol had cases of brass, indicating that more than one type of metal is used in the manufacture.

The flare pistol was at first thought to be made of steel; later, as a result of tests, it was found the pistol frame and barrel were made of aluminum or an aluminum alloy, but, of course, various pins and parts are made of steel. This accounts for the extreme lightness of the pistol. The actual weight of the entire pistol is 1.58 pounds.

The pistol, while being very light and versatile, has a very heavy recoil. This is to be expected, as the recoil varies inversely with the weight of the pistol. Another detrimental feature is that it has a very large number of parts. This does not seem to be necessary for the use to which the pistol was intended. Also long cartridges, such as those containing parachutes, do not readily slide in and out after shorter flare cartridges have been fired because of the formation of a "cake" inside the barrel.

SECTION II

OPERATIONS AND TACTICS--GUADALCANAL

OPERATIONS AND TACTICS--GUADALCANAL

PART I

GUADALCANAL OPERATIONS

The following is an informal report on Guadalcanal operations by a high-ranking U.S. Marine officer. It is not, and was not intended to be, a complete report, but consists of observations on certain aspects only. For purposes of security certain portions of the original report have been omitted.

* * *

LANDING OF JAPANESE REINFORCEMENTS

You are all acquainted with the endeavor of the Japanese to knock out our air and neutralize our effort on Guadalcanal. They tried it time after time without success, and their whole counteroffensive was frustrated on that account. Seeing that they could not knock the air out, they attempted on several occasions to come down with navy transports without air coverage.

Throughout late September and early October the so-called "Tokio Express" landed troops on the islands from cruisers and destroyers. This method the enemy found slow and unsatisfactory. In the first place, they could carry very few troops in the cruisers and destroyers; and in the second place, they could carry no heavy materiel. It was therefore absolutely necessary for them to come down with naval transports. On the night of the 13th and 14th of October, they came in with a striking force of surface ships off Guadalcanal. The battleships lay off Savo Island at a range of 34,500 yards. The cruisers were closer in, and the destroyers were just out of range of our 5-inch shore batteries. They bombarded Henderson Field for 2 hours and 45 minutes with 16-, 8-, and 5-inch shells. The damage to personnel was negligible. The damage to ground materiel was also negligible.

We could not prevent the convoy of six transports from coming in. One of them, however, was sunk on the way down. Four of the transports were beached in order to unload. By 1 o'clock that afternoon all four of the beached transports were on fire. The dive-bombers had accounted for three of them, and the B-17's, which flew over, accounted for one. The sixth, and remaining transport, was hit with a thousand-pound bomb. It turned away and left, together with its escort vessels. This belated destruction could not prevent the enemy from landing some 16,000 Japanese troops on the island. They did not succeed, though, in getting off very much heavy materiel. They managed to get off a company of light tanks and a battery of long-range artillery. ***

JAPANESE GROUND ATTACKS, OCTOBER

The Jap attacks on October 25 to 28 were ground attacks, which were a result of this landing. *** This was their last really major effort. It was put on by a division, plus two additional attached regiments. They attempted to cross from the west with a mass attack of tanks followed by infantry. The rivers, in

the dry season (except the Lunga and the Matapona), are more in the nature of lagoons than rivers. There is a beach which closes up the mouth of the river, and they are about 15 to 20 feet deep down at the mouth. They go up to about 10 feet for 1 1/2 or 2 miles inland. There is a sand-spit that runs across the Matanika River, and the enemy (very foolishly) drove these tanks right along it. I can assure you it was certainly fine shooting for the antitank guns. They knocked out the tanks with the 37's and the 75-mm half-tracks. One enemy tank got through. It might interest you to know that he stopped over a rather deep fox-hole of a man who had the presence of mind enough to reach up with a hand grenade, place it in the tread, pull the string, and duck. It blew a tread off, and the tank wheeled around like a wounded bird, and started right out to sea. He went out until he couldn't run any further. He was then up to his turret - and so a half-track knocked that off.

The command tank in that performance, for some reason or other, decided to come straight across the river, about 50 to 60 yards up from its mouth - and he was not a submarine. He just stayed there, and disappeared out of sight. Realizing that tanks don't go strolling off by themselves, we put down a concentration by 13 batteries on the west flank of the river and walked it back. The next morning we counted 657 Japanese in there.

THE NAVAL ENGAGEMENT, NOVEMBER 12

The night of November 12 was really the turning point of the whole show. The Japanese were making a major effort. They had concentrated up in Rabaul and the Shortland Islands; and also, coming down from Truk, they had from 20 to 40 merchant ships and a sizable fleet, together with 2 carriers. Their striking force for bombardment, with which they hoped to duplicate the October show, came in and was met in a very memorable battle, which almost reminded you of the days of John Paul Jones. The leading destroyer of our fleet opened up on a Japanese destroyer at 200 yards on the port bow. *** The Japanese broke away. ***

For an hour after our ships had broken off, the Japanese were firing at each other.

The next morning, 11 transports appeared. (Our morning search-and-strike had been warned they were on the way down.) We combined a search-and-strike, and fanned out and found 11. The Southwest Pacific air arm had sunk one ship off the Shortland Islands on the way down. They had a full division, some corps troops, a full headquarters staff, and some extra regiments.

By noon, 4 of the 11 transports were sunk. By afternoon, three of the others were burning fiercely and were dead in the water. The other four were burning. The dive-bombers just ran a shuttle service from Henderson Field to the transport group, with our Grummans and P-39's acting as escort. Just as fast as they could get back and fuel and re-arm, they took off again. Those boys worked like nobody has ever worked before, to my knowledge; and certainly they did a splendid job.

That night a U.S. Navy task force came through, and much to the surprise of the Japanese it included two battleships. The opening salvo *** landed on a Japanese battleship, and the thing disintegrated. It was a marvelous sight to see. I had a grandstand ticket for which I paid nothing, sitting up on my observation hills, watching it. The *** put another battleship out so that it could not go more than 5 knots an hour, and we sank two or three cruisers and some destroyers.

The next morning the enemy battleship was lying just north of Guadalcanal between Florida and Savo Islands, and our dive-bombers went out after it. The more they went at it, the madder they got. They hit it with 1,000-pound bombs, and our torpedo planes put their torpedoes in it. At dusk it was still there, though nobody was on it. The next morning she wasn't there; ***.

AIR ACTION

I won't give you a day-by-day account of our air fights. We went in on the 7th, and the field was 90 percent completed. *** It took us 10 days to complete the strip so it could take light craft - the Grummans and the dive-bombers. A week later the P-400's and the P-39's came in. Daily, after the third day, for 72 days the Japanese came down with their usual formation of 26 twin-engine high-altitude bombers. They fly a beautiful formation. They were rather inaccurate in their bombing, but I can assure you that nothing stopped them from coming for the first 10 days. They just kept on coming, they had the air to themselves, and they came over and dropped them. When our planes got there, we were very fortunate in being able to knock down a number of Japanese planes - 541 to be exact.

Our antiaircraft consisted of 90-mm's, plus the lighter 20's, 37's, and 40's. Our antiaircraft knocked out 48 planes. I watched them one day knock out 6, and the Japanese closed in just like it was a parade formation, and kept on coming. They dropped their bombs.

As a little digression, one day after we had been bombed for about 40 days, we got word that this bomber formation was on its way down and we thought that, "Well, this is one time we up here in the jungle are not going to get hit." For there were some 12 of our merchant ships out there in the roadstead. We felt very sorry for the ships - we knew they were going to get it. However, somebody had told the Japs at Rabaul that they were to bomb Henderson Field, and they paid no more attention to those ships than if they weren't there. The bombers came right along and dropped them in the same old place on Henderson Field. This is just an idea as to how they work.

When our P-39's joined us - one squadron of them - they proved themselves to be invaluable as ground-strafing planes. We used them constantly on ground installations and they proved most valuable.

We were most fortunate towards the end to get a squadron of P-38's. They could get upstairs so fast. When we moved towards the west our air support was splendid.

I would like to say here that it is most difficult in jungle country for air reconnaissance to give you any valuable aid as to ground installations which are in dense jungle.

MAPS AND PHOTOGRAPHS

Prior to our landing, we sent our intelligence officer over to Australia. The Australians gave us what they had in the way of maps (which was practically nothing). We had one strip map that went about 500 yards inland and had been taken on a day when there were clouds around - and when you would get nice blank spaces with a picture of the clouds. We were to get additional photographs dropped on us on our way up. We got one - which did help out materially. It was of Tulagi. In that section there are practically no maps available; and, unless you do have constant aerial reconnaissance and pictures, you are going it blind. We were very fortunate on Tulagi. We met with very little resistance; and therefore the lack of maps and photographs was not such a handicap as it would have been under other conditions.

THE U.S. LANDINGS IN THE SOLOMONS

I will just give you a brief sketch of the landing. We were very fortunate on our approach day in having a very low ceiling, without a break in it. So we arrived off Savo Island without the enemy knowing we were there. At that place, the Tulagi support group went to the north of the island, and the Guadalcanal force to the south. As we approached, the opening shot was fired just off Lunga Point. A Zero float plane took off with a cold engine and flew directly at the Australia, the flag ship of the Australian cruisers. It was knocked out by broadside guns when within about 300 yards of the ship. Just at that time our dive-bombers came over and destroyed 18 float planes in the Tulagi area, and in addition destroyed 2 four-engine Japanese Navy flying boats.

The Tulagi landing was first. It was preceded by a naval gun bombardment which took the forward slopes of the hills, supported simultaneously by the dive-bombers taking the reverse slopes. It was a regimental landing, battalions in column. They landed without losing a man. They made for high ground, straddled the ridge, and turned east where the major installations of the Japanese were, throwing in a block to the west to hold whatever was there. I can assure you it was rather rough as they worked their way down through jungle country, against defenses of machine-gun nests supported by mortars.

The Japanese took to the caves and the dugouts that they had built, and tried to defend from there. We tried to drive them out of there with hand grenades, which they immediately threw back to us. When that didn't work, we tied TNT onto sticks and threw that in with a fuse. The men held them as long as they could and then threw them into the caves.

On Gavutu, which was 2 hours later, the Japanese took to the caves first - but they had a good machine-gun defense of the island. We lost quite a few men there; and it goes to show that if they have enough head protection you cannot

shoot them out with naval gunfire, nor can you bomb them out with aerial bombs. On Gavutu the commander, being rather air-minded, had 57 feet of rock over most of the dugouts. They were dug right into the mountains and hills.

In Guadalcanal there was not much opposition, as I said - and our air support over there, every time they had to go back to refuel, would ask for a target. We told them to drop them on Gavutu. So, in addition to getting the bombardment scheduled for it, Gavutu also got practically all of that scheduled for Guadalcanal. Yet, according to a Japanese prisoner's statement, there were only three people killed either by artillery or by ships' gunfire on that island. They were stunned, yes, but they were able to work their machine guns when the landing came off. Gavutu was pure and simple assault. The island was small. It had to be taken in a rush; and that was the way it was taken; and they were eventually driven out of their dugouts as they were driven out on Tulagi.

On Guadalcanal, the ships' guns put down a bombardment on the beach, and, as the assault boats approached the beach, the ships' guns left off. When the leading wave was within 300 yards of the beach, the aerial bombardment lifted. The scheme of maneuver there was to land regiments in column, the leading regiment to seize the beachhead which was 5 miles east of Lunga point, and the second regiment to pass through and attack - the idea being to get behind the Japanese in an endeavor to keep them from getting to the mountains. It went off as planned, with no opposition. They moved - and then the regiment which formed the beachhead moved up the beach, and another one came up the hills on the flank. That going was very dense. *** We arrived at Henderson Field the next morning at 10 o'clock.

The Japanese thought, according to the prisoners that we took, that it was an air-and-sea raid; and they had been instructed on Guadalcanal that in event of air-and-sea raids they were to leave the vicinity of the field, go to the jungle, and not come back until the ships left. When they came back, of course, we were there.

JAPANESE ATTACKS

The first real opposition of any kind that we met on Guadalcanal was when the Japanese Commando battalion of a thousand or twelve hundred men landed south of Henderson Field one night from two cruisers and six destroyers, and made a direct drive at the field right down the beach. Evidently their intelligence was poor or they thought very well of themselves; or perhaps there was a combination of the two. When they hit the Tenaru River, which was 15 feet deep except at the mouth, they tried to force the mouth of this river across a sand-spit in a mass rush. Our 37's loaded with cannister stopped that. We put artillery down on them and then sent a battalion down from the south and pushed them toward the sea. Then, when they were down on the beach line where it was open, we sent a company of tanks down their flank. We accounted for 670 of that Commando Group in that one location, and the next day 156 washed up from the sea.

*** On the night of the 14th and 15th of October, a Japanese regiment had cut their way around the field. This unit was equipped with scaling ropes - every three men had one. They cut in and attacked from the south at the junction of the *** Marines and the *** Regiment [Army], with the *** Regiment taking the brunt of the attack. There was a double-apron wire around there. The attacking battalions thought they had gotten through all the wire because their pictures did not show the other apron we had in the jungle - just on the edge of it. So, when they got through the outer apron, they rose up and with that Banzai of theirs, which they had thought would do half of the work for them, they charged. They were caught on the second apron, and 1,200 of them were knocked out with machine guns and remained at that place.

AIR SUPPORT OF LANDING OPERATIONS

I would like to give you, for what it is worth, what we who were there feel that we learned as to what is necessary for a landing force. In the first place, I don't believe that any landing against opposition is in anyway feasible unless you have an umbrella of air over you which can protect your transports, your surface ships, and your ground troops in landing. There has got to be the closest coordination and the closest timing between the bombardment of the ships' guns, and the lifting of the ships' gunfire and the picking it up by the air. For, there is a little space in there where you cannot have ships' gunfire support, because of the flat trajectory, and where your assault waves are approaching the beach - and unless somebody keeps that beach defense down, it will be rather costly.

I want to say along that line that in this instance the bombardment was beautifully coordinated by the naval air and the naval surface ships; and that from the time a battalion commander called for a concentration on a certain locality by air to the time that the concentration was delivered, it was in one instance exactly 3 1/2 minutes--which is very good going.

I would like to say a few words about the types of planes we felt should accompany a landing force in the South Pacific Theater of Operations. Because of the type of ground we have there, and the type of islands that we have to deal with, the planes must be light aircraft capable of operating from small fields. They must be aircraft that can operate on a reasonable fuel supply.

We had some difficulties along that line. All of our fuel had to be brought in, unloaded into small boats, and then taken ashore. It was unloaded from small boats across open beach, or onto finger docks which we constructed out of palm trees and other material we had. It was then hauled to dumps, and then put into our gas carriers by hand pumps. *** All of that gas had to be man-handled in 50-gallon drums. The first storage tanks went into commission just about the first week in December. When we staged the B-17's through, they took a tremendous supply of gas, which we had to handle by hand in that manner. *** Our major labor question there was handling the gas. The sooner that you can get bulk storage into a place, the better it will be for everyone concerned. ***

PART II

JAPANESE OPINIONS ON AMERICAN TACTICS

These Japanese opinions on American tactics are derived from U.S. Navy sources. The Japanese based these opinions on operations in the Philippines and the fighting on Guadalcanal up to November 1942. It should be noted how strongly the Japanese emphasize the importance of infantry shock action. This is not shock action as we think of it; rather, their concept is limited to the carrying of a position with the bayonet. The emphasis is on the individual soldier, rather than the unit and the coordinated action of all arms. It will be interesting to note what changes, if any, the Japanese may make in their tactics as the result of their defeats in New Guinea and Guadalcanal.

* * *

FOREWORD

American troops on Guadalcanal consist of a main body of Marines, whose quality in character and equipment is the pride of the American forces. With them are cooperating some Army troops and Army and Navy air forces. Although the Army forces will probably be reinforced in the future, it is estimated that the Marines will still be the backbone of their forces.

Judging by the results of the fighting up until now, the information set forth in the "Material for Study on American Tactics" just about hit the nail on the head.

The following investigates the results of their usual methods of fighting, especially in the light of past fighting on this battlefield [Guadalcanal], and will be used as a reference in the next operation.

NOTE: With regard to land warfare, this report is chiefly compiled on the basis of Army combat.

ORGANIZATION AND EQUIPMENT

The organization and equipment of the Marine force are as given in the Table of Organization and Equipment of the American Marine Division and the American Marine Force Independent Battalion, compiled by the General Staff Office in August 1942. For more on equipment and weapons, see the Army Technical Headquarters reference book.

CHARACTER (from official reports on the national characteristics of the American people).

(1) National unity is fairly strong.

(2) They like novelty and are adventurous.

(3) They are good at every sort of technique. [It is believed the Japanese mean "good in all technical matters."]

(4) Although they are given to discussion, they possess practicality. However, they take a lot of time.

(5) Although they are optimistic, they lack perseverance.

(6) The American soldier, without support of firepower, is easily overcome and in combat is easily made to throw up his hands and surrender. If wounded, he immediately raises a cry of distress, etc. He lacks hand-to-hand fighting ability and spiritual strength. However, with the support of firepower, he acts fairly aggressively.

TRAINING

(1) Marksmanship is generally good.

(2) Hand-to-hand fighting ability is extremely poor.

(3) Night actions are inexpertly carried out.

(4) Communication technique is excellent.

(5) Reconnaissance and security patrol training is very inadequate; however, their reconnaissance aviation is generally all right.

(6) Air-ground liaison is good.

(7) The training of artillery and their method of using it are generally good.

(8) They are skillful in operating tanks and automobiles.

COMMAND AND COMBAT LEADERSHIP

(1) They subscribe to the principle that fire-power is everything, and their tactics are marked by a strong tinge of position warfare.

(2) They distribute their forces in great depth.

(3) They neglect the power of cold steel (i.e., sword and bayonet).

(4) Their flanks and rear are particularly sensitive. It is said that many times, even when only small units or patrols are on their flanks or in their rear, they have lost calmness of command [literal translation] and their actions have been hampered.

ATTACK

Even though we may say that the enemy is on the offensive, unless they have a complete faith in their material strength, especially their artillery superiority, they have a tendency not to attack. To judge by the enemy's landing on Guadalcanal and his advance to the west in the last 10 days of September, the advance of his first-line units is begun only after considerable pressure has been placed on us by ground strafing by the air force or by the fire of heavy guns. The distance they will advance at one time is limited to the range at which the main artillery force can support them from the rear. Further advance is begun after the artillery is displaced forward and preparations completed. Ordinarily the attacking forces advance during the daytime, accompanied by trench mortars and supported by artillery and aircraft. At night they generally remain at rest in the position where sunset finds them.

There is a tendency for the main body to keep close to both sides of roads and not utilize the jungle, except for small forces and patrols. If they stop and do not move out for a day or two, they construct light wire entanglements.

DEFENSIVE FIGHTING

Although they make it a principle to destroy the enemy in front of the main line of resistance of a defensive position, they also advocate active counterattacks within the positions. [The Japanese principle of defense is to give with the blow, let the attacking enemy become disorganized by his advance, and then counterattack in force.]

In front of and within their positions, they prepare thorough concentrations of firepower, especially that of trench mortars and artillery, and they use ammunition abundantly. Furthermore, in not a few cases, the troops holding the position fell back and then artillery fire was concentrated in the area they had evacuated. Also, artillery fire concentrations are laid down in the jungle in front of the positions. There are units that have received heavy casualties on this account. It seems that they carry out test firing beforehand at each place. [This must mean registration fire. It is amazing to find a remark like this. It shows a remarkable lack of appreciation, on the part of the Japanese, of the capabilities and limitations of artillery. This has been intimated by other sources.]

They install microphones in front of and within positions, and utilize mobile artillery-observation stations to perceive our approach so that fire may be concentrated on our force. The "mikes" are gray in color and of large type, in large leather cases. They are installed at the roots of trees, etc. The wires are black insulated wire.

Their airplanes, particularly fighters, reconnoiter and make bombing and strafing attacks, and act very aggressively. As the fighters carry out their strafing and bombing at low altitudes by diving, there are frequent opportunities

to shoot them down when infantry units can carry out AA firing.

Their forward units sometimes use a successive resistance. [Probably means delaying actions.]

For security to the front of their positions, they send out forces about the size of a platoon and generally avoid posting sentries in small groups, with the result that there are many gaps. The security measures in the position itself are also insufficient, and it often happens during a battle that our patrols stumble upon enemy positions and find AA gun positions, provisions, dumps, etc. On account of their not posting observers in front of the positions, the attackers [i.e., Japanese] sometimes, contrary to what might be expected, suddenly and without warning come in contact with the main position and receive unexpected losses.

Although their counterattacks are not vigorous, they sometimes execute them against our flanks and rear at very short distances in front of their positions. However, they don't use cold steel (bayonets).

NATURE OF DEFENSIVE POSITIONS

Their wire entanglements consist of roof-shaped and net-shaped entanglements, and low wire entanglements, and are constructed over the whole front of the position. Although there are three or four bands of wire at important points, there are also light entanglements of about three strands of barbed wire. Empty cans and so forth are fastened to the wires. Electrically charged wire entanglements have not yet been observed.

Pillboxes are chiefly covered machine-gun positions, and are deployed in depth every 200 or 300 yards along the front. Many log ones have been used, but as yet none of the concrete type have been observed for certain.

At present the enemy is burning back the jungle here and there to clear the field of fire, establishing more covered machine-gun positions, and constructing other installations so the positions will be made increasingly stronger.

WITHDRAWAL TACTICS

Withdrawal from the field is carried out under the protection of the main artillery force. When in a coastal area, they use landing boats a great deal.

NIGHT FIGHTING

They fire actively at night, especially trench mortars, and where preparation has been made, the fire has considerable effect. They almost never make night attacks.

PATROLLING

Extremely few patrols are sent out, and when they execute a reconnaissance mission, it is generally with a platoon or a larger force, and almost like a reconnaissance in force. The afternoon of September 24, about 100 of the enemy appeared in the vicinity of the OKA Force's observation post and ran into some of our people who were cooking. They were scouting in preparation for the advance which the enemy made several days later in the vicinity of the Matanikau River.

They carry out vigorous air reconnaissance. They execute especially thorough strafing and bombing attacks when they spot the smoke of our cooking fires, or when our soldiers are moving in the open.

MISCELLANEOUS

Their tanks traverse almost any kind of terrain; however, their action is independent, and there should be many opportunities to take advantage of this.

Automobiles are used everywhere in large numbers, and are used even off the roads.

POINTS TO NOTE IN OUR COMBAT

(1) In many cases our attacks on positions are ineffective without organized fire support. Even a night attack must have a thorough artillery preparation, and we should not hesitate to use firepower support forces. [The composition of these "firepower support forces" is probably battalion and regimental infantry guns, 37-mm antitank guns, mortars, and machine guns: in other words, the infantry heavy weapons. The Japanese have a tendency to neglect proper use of these, placing their dependence on the maneuver and "cold steel."]

(2) In infantry fighting at close quarters, crawling forward and utilizing dead ground has many advantages.

(3) The terrain of the battlefield is generally hilly; on high ground are mostly grassy plains, and in the low places there is jungle. In the jungle we can conceal our intentions, but it is extremely difficult to maintain direction there, so it is necessary to make careful plans and preparations beforehand, and to gain and maintain complete control of the unit.

(4) It is difficult to determine (in the jungle) where one is and where the objective of the attack is; therefore, it is necessary for commanding officers of all units to have a complete knowledge of the locality, the route of attack, etc.

(5) Effective shelling is often received in the jungle in front of the enemy positions, and there have been cases where this disorganized the ranks and ultimately rendered a charge impossible. The commanding officer must give special attention to the control of his force.

(6) Search out the "mike" positions, and at a predesignated time destroy them simultaneously, taking care to cut the wires.

(7) Since the enemy reacts very quickly to our artillery fire, we should establish artillery positions everywhere, and by utilizing dummy positions, smoke, etc., confuse the enemy and make him waste his shells. In not a few cases, the skillful establishment of false positions at the front and flanks of important points occupied by the infantry in the face of the enemy has been attended with great success.

(8) While preparing the attack, full attention should be given to the supply and concentration of ammunition, provisions, water, and so forth.

(9) If we close with their firepower [Translator's note: This phrase may also be translated "closely allied with firepower."], our cold steel still has a decisive force and the enemy fears it greatly.

(10) Considering the difficulties of the terrain, unusual amounts of exertion and time must be expended in the preparation for the attack.

(11) As the health situation is not good, the men must not be allowed to catch cold while they sleep.

(12) In case you stay rather long in one place, air-raid trenches must be dug, without fail. If the earthworks are completed, any sort of concentrated fire, or bombing, can be withstood without great loss.

(13) During the day, smoke from cooking fires is absolutely forbidden. In case of cooking at night, you must not allow firelight to show.

CONCLUSION

To sum up, the enemy's military preparations may be said to be built on a framework of a materialistically organized firepower, with the benefits of air activity added. They are never seen to maintain any particular fighting power, and although they are at present exerting themselves in the extreme and strengthening their positions, if we make especially thorough preparations, prepare our fighting strength to deal hammerlike blows against the enemy, concentrate on using all sorts of original plans, and carry them out with a flourishing aggressive spirit, our success in the present operation is certainly beyond doubt.

CORRECTIONS

ENGINEERS

No. 18, p. 12: The article beginning on this page was entitled "Italian Variable-Pressure Mine." It is now reported that this is a Hungarian mine; at least some of these are manufactured for the Axis in Czechoslovakia.

SIGNAL CORPS

No. 19, p. 44: In sub-paragraph (1), it was stated, with reference to signal security, that "the enemy found it impossible to predict a certain attack from an examination of requests for supplies." The word "impossible" should read "possible."

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[redacted]

TACTICAL AND TECHNICAL TRENDS

No. 23

April 22, 1943

Prepared for

ARMY GROUND, AIR, AND SERVICE FORCES

by

MILITARY INTELLIGENCE SERVICE,

WAR DEPARTMENT

[redacted]

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SECTION I

AIR

1. RECENT FLYING LIMITATIONS IMPOSED ON GERMAN AIRCRAFT

An indication of possible reckless or unintelligent flying on the part of GAF pilots may be found in recent instructions, establishing certain restrictions on the operation of various airplanes, issued by the Germany Air Ministry. This was done to reduce the loss of, or damage to, particular planes by overtaxing their capabilities. The particular types covered are the FW-190, the Me series, the He-177, and the Ju-88.

The maximum permissible operating speeds for the FW-190 have been reduced from 466 mph at all heights to the following:

Up to 10,000 ft - 466 mph
From 10,000 ft to 16,500 ft - 428 mph
From 16,500 ft to 26,250 ft - 360 mph

These speeds are to be marked on the air speed indicators in each aircraft and are only permissible with strengthened elevators. Aileron corrections at high speeds must remain within moderate limits.

The He-177 combines light elevator control with good elevator effect, but has a comparatively low factor of safety, with the result that wrinkling of the skin on the wings or wing failures may occur from careless flying. Permissible full-out acceleration at the present time amounts to 2.3g with a flying weight of 27 tons, and crews are reminded that high stresses may be caused when pulling out of a glide at high speed, by sharply pulling up out of horizontal flight at any speed, and in steep turns or by strong vertical gusts at high speed. A warning is issued that the automatic pull-out apparatus can unintentionally cause a strain of over 2.5g by tail-heavy trimming before the release of the bombs, by pulling back on the control column at the time of the automatic pull-out if the centre of gravity lies too far to the rear, or when dive-bombing is done in very gusty air. In the latter case, speed should be reduced to 186 mph. The pilot must be trained to watch closely the air speed indicator and the acceleration warning apparatus during every pull-out.

In the case of all aircraft of the Me-109 series, including the Me-109G, attention is called to the numerous accidents caused by wing breakages, resulting from strains induced by air speeds in excess of the permissible maximum limits. All previous limitations are therefore cancelled and the following are substituted (previous limits are given for comparison):

	Limit	Previous Limit
Up to 10,000 ft	466 mph	466 mph
At 16,500 ft	435 mph	425 mph
At 23,000 ft	357 mph	382 mph
At 30,000 ft	280 mph	341 mph
At 36,000 ft	248 mph	304 mph

A corresponding notice is to be placed on all airspeed indicators in these aircraft.

Warning is also given against yawing in a dive, which under certain conditions leads to high, one-sided wing stresses which the wing tips cannot support. When yawing occurs, the dive is to be broken off gradually, without exercising force. Wing tips must be examined and checked frequently for signs of failures. When yawing is encountered during turning, correction must be made with the rudder only and not with the ailerons. Mention is also made of high-wing stresses caused by the unintentional unlocking of the landing gear, especially the dropping of one side in a dive. It is stated that steps are being taken to prevent this.

Apparently, even the yellow recognition paint on the ailerons changes their characteristics unfavorably and paint already put on is to be removed.

Reference is made to the difficulty of controlling Ju-88 aircraft at a dive angle of 60°, and it is stated that in the future they are to be rigged for a dive angle of 50° only. This will limit the indicated air speed in the dive to between 329 and 341 mph as against 341 to 354 mph obtained in a 60° dive.

2. THE Me-109 G

A new "G" series of the Me-109 has been reported and at least two sub-types, the G-1 and G-2, have been in operation. The sub-types are numbered from 1 to 6, the difference being that the odd-numbered models are fitted with pressure cabins which the even-numbered versions lack.

In general, the design and structure of the airframe is similar to that of the Me-109F, with a wing span of 32 ft 7 in, a length of 29 ft 4 in, and a gross wing area of 172 sq.ft. It is powered by a Daimler-Benz 605-A1, inverted "V", 12-cylinder, liquid-cooled engine, which, in the case of the G-2, gives a maximum speed of 378 mph at 23,200 ft.with tropical equipment, and 395 to 400 mph at 22,000 ft. without it. The non-tropical version is estimated to climb to 18,000 ft. in 5.3 min., and at that altitude is believed to have a normal range of 415 miles and a maximum range of 725 miles. The regular fuel capacity is estimated at 106 U.S. gallons, and there is provision for a jettisonable fuel tank of a 78-gallon capacity fitted to a quick release hook below the fuselage. This feature increases the normal range to 755 miles and the maximum range to 1,250 miles. Although the main fuel tank is generally not self-sealing, an aircraft was found to be fitted with one that was self-sealing.

The armament consists of one 20-mm cannon firing through the spinner, two 7.9-mm machine guns mounted above the engine, firing through the propeller arc, and provisions have been made for two 20-mm cannon

mounted in fairings below the wing, about 12 in. inboard of the leading edge slots. When used as a fighter-bomber, either one 550-lb. bomb, four 110-lb. bombs, or 96 antipersonnel bombs can be carried. In such case, no jettisonable fuel tank could be fitted.

The pilot's back is protected by 8-mm armor plate and his head by 10-mm plate, the latter attached to the jettisonable cockpit cover. There is a laminated, duralumin bulkhead about .75 in. thick, placed behind the fuel tank. In front of the pilot is a 2-1/2-in. bullet-proof windshield, forward of which is 1/4 inch of plexiglas plate fitted with a glass plug screwed in the corner, containing a moisture-absorbing substance to prevent condensation between the two plates. While the cockpits in all models are probably sealed, only the odd-numbered versions are pressurized. In the latter aircraft the pressure inside the cabin can be regulated by moving a pressure valve within small limits, to "Rising" or "Falling" up to 19,700 ft. altitude. Desired compensation of pressure (presumably during descent) may be obtained by operating a rapid-pressure-release valve, and up to 9,800 ft. altitude ventilation may be obtained in the same manner. The cabin is also provided with dessicant "cartridges" between the double panes of the superstructure.

ANTITANK

3. GERMAN ANTITANK MAGNETIC CHARGE

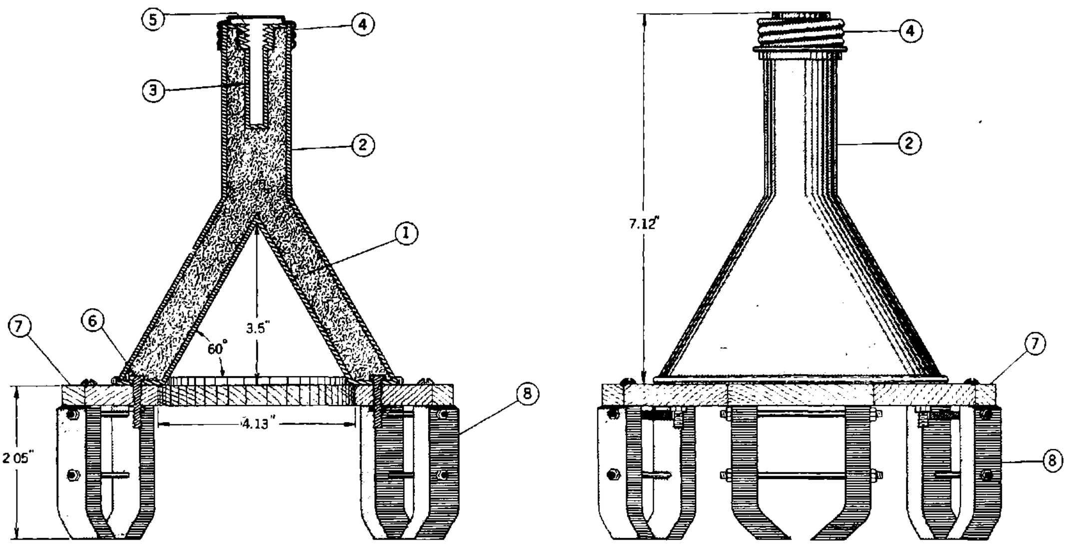
Until a technical analysis reveals a detailed breakdown of the functional operation of this device, a practical, field analysis, made in the Middle East, is given in this report with a sketch which is not to scale.

a. The Grenade

It is painted field gray. The magnets attached to the base of the charge are said to be strong enough to hold it against a vertical surface. The total weight is about 6.5 pounds--the magnets themselves weighing about one-half the weight.

The main filling (1) is contained in a pressed metal container. The neck (2) performs the dual function of forming a hand-grip and also contains a recess (3) for the detonator. A screw-threaded closing cap(4) is set above internal screw-threads (5) which receive a BZE igniter (see description below of this igniter). Six bolts (6) tie the base of the conical portion to the magnets. Between the magnets and base of the conical portion is the plywood framework (7). There are three horseshoe magnets (8).

Additional information obtained from enemy sources further serves to identify what is apparently the same grenade. The grenade is called Hafthohlraum Granate (clinging hollow-space grenade); it is funnel-shaped, and adheres to an enemy tank by magnetic attraction. It was said to be first employed on the Russian front in July 1942. These grenades are either transported in cardboard containers or else suspended from the soldier's belt.



In using the grenade, it is reported that the soldier moves forward towards a tank, via the "dead area" where the tank is unable to reach him with its fire. Upon reaching the tank, he places the grenade against the hull where it adheres through magnetic attraction. The fuze is pulled at the same time. Meanwhile, the grenade holds fast to the metal for several hours.

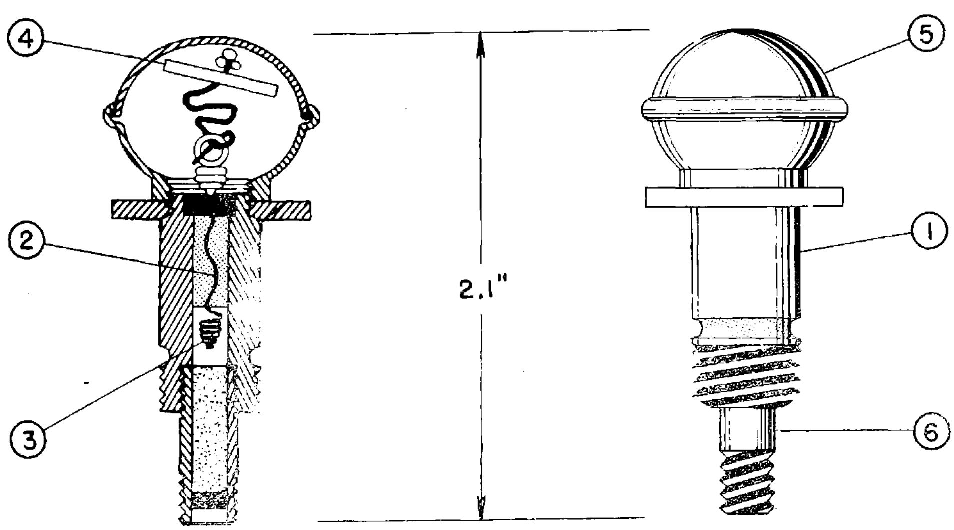
The destruction is caused by simultaneous melting of the metals and by destructive explosion.

The funnel-shaped body of the grenade is made of thin steel. The incendiary material is described as a pink dust which, when ignited, gives off a terrific heat - sufficient to burn through the armor plate almost immediately. Heat is accompanied by an explosion and the emission of choking gases.

b. BZE Igniter

(1) General

This is the standard igniter for the German egg-shaped grenade; it may also be used with demolition charges and booby traps. The head (5--see sketch) is painted blue; this igniter has a delay of about 4 1/2 seconds. However, there is a similar igniter with a head colored RED which has a delay of only 1 second. The latter is used with the so-called German "shaving stick grenade" (used as a booby trap) and a signal smoke flare; when used with these, the igniter cannot be easily removed because of the locking nut on the underside of the lid of the container, but they are reasonably safe to handle once the igniter has been neutralized.



BZE. IGNITER

It is important to note that it has recently been reported from North Africa that German egg-shaped grenades have apparently been booby-trapped with the 1-second delay igniter; if the red cap is removed and the firing cord pulled the grenade detonates almost instantaneously.

(2) Description

The BZE igniter consists of a brass body (1), which contains the friction composition through which the pull wire (2) is drawn. The lower end of this wire is coiled (3) to provide the resistance to the pull. The upper end of the wire has a loop through which is fastened one end of a cord 2 1/4 inches long.

The other end of the cord is attached to a disk (4) inside the spherical head (5). As the head is unscrewed and pulled, the slack in the cord will be taken up when the disk catches in the opening of the head. Pull is then exerted on the wire, the friction composition is ignited, and in turn ignites the compressed powder in the steel tube (6).

(3) To Neutralize

(a) If the igniter is found with the head in place, it is safe to handle without further manipulation.

(b) To render the igniter inoperative, carefully unscrew the head, taking care not to exert any pull on the cord.

(c) Cut the cord by means of scissors and replace the head with the cord inside.

ARMORED FORCE

4. COINS AS A MEASUREMENT OF ARMOR THICKNESS

A convenient means of measuring armor thickness when no scale is available, is by comparison with a coin of known diameter. The following table may be of interest. The measurements are in terms of inches.

U. S.	British	French
1 cent - 0.750	1/2 penny - 0.650	5 centimes - 0.630
5 cents - 0.835	1 penny - 0.984	10 centimes - 0.866
10 cents - 0.705	6 pence - 0 737	20 centimes - 0.945
25 cents - 0.955	1 shilling - 0.905	50 centimes - 0.669
50 cents - 1.205	2 shillings ("Florin") - 1.102	1 franc - 0. 905
Silver dollar - 1.500	2 shil. 6 pence ("Half Crown") - 1.220	2 francs - 1.063

ARTILLERY

5. GERMAN VISUAL SIGNAL SYSTEM FOR ARTILLERY FIRE CONTROL

Recently information has come in from German sources of what seems to be a simple visual signal system for artillery fire control in the event of failure of other means of communication. Apparently, it is employed between OP and gun position. Also it may possibly be used between a forward observer and his communications detachment, when, for one reason or another, it is necessary for the latter to remain at a distance from the observer.

No knowledge of any general signal code is required, and the apparatus can be nailed together and painted in half an hour.

Two disks or panels (see sketches) are required, attached to short rods or handles--such as a barrelhead nailed to a broomstick. The disk is possibly painted half red, half white or whatever other colors that may be more suitable to the background. These disks are used as shown in the accompanying sketches. At night lights are used.

CHEMICAL WARFARE

6. GERMAN ACID SMOKE FLOAT

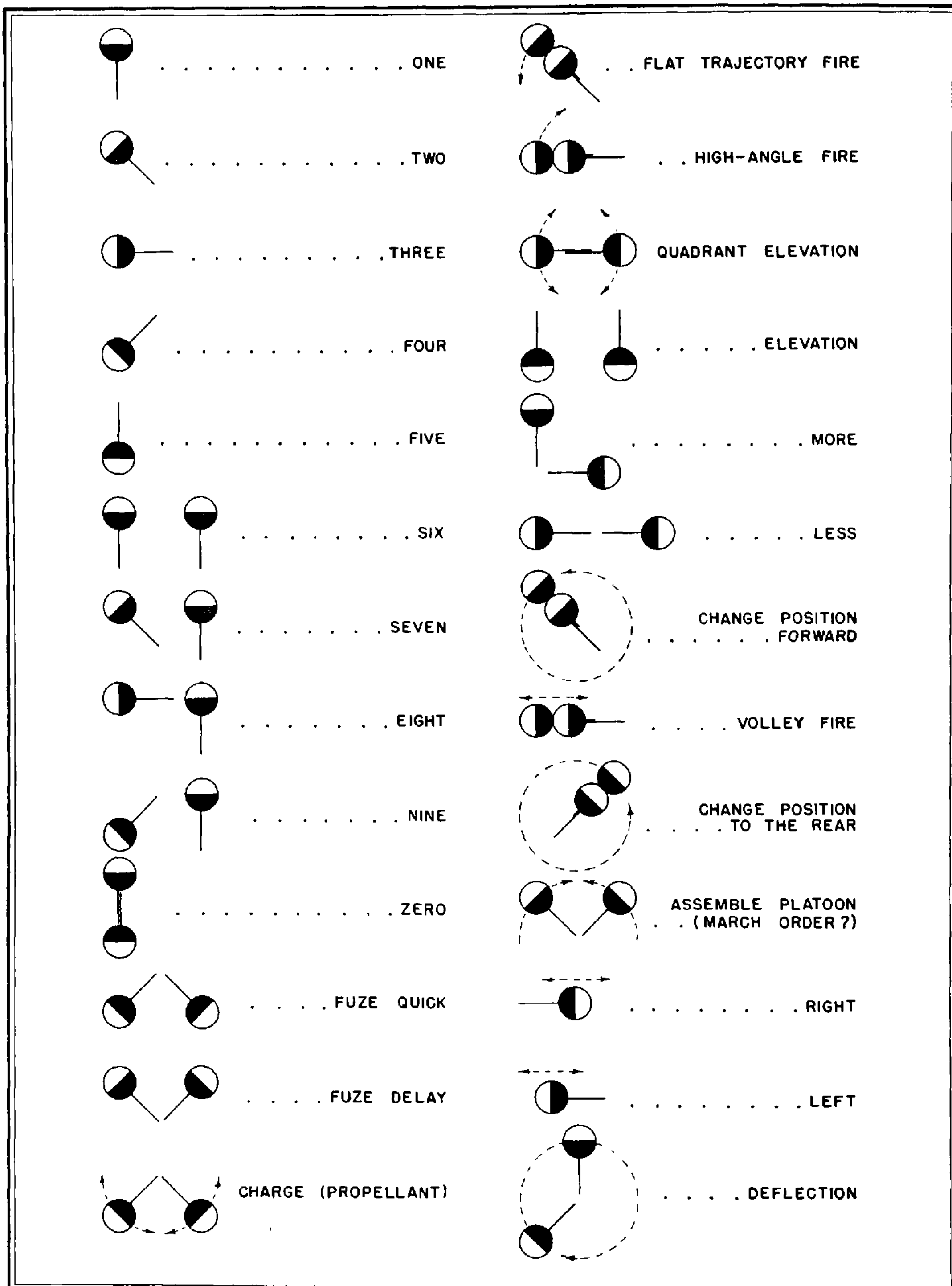
German smoke floats, captured at a North African port, are described below.

Each float weighs 42 pounds empty, and 83 pounds charged, and is 32 inches high by 12 3/4 inches in diameter. The time of emission is 8 to 9 minutes.

The float consists of the chemical contianer arranged inside a drum-shaped buoyancy chamber. A pipe, open at the bottom and closed by a valve at the top, admits water to the chemical container. The valve is operated by a spindle extending to the top of the float.

When smoke is required, the valve spindle is withdrawn and the float is lowered into the water. Water entering through the inlet pipe reacts with the chemical filling, thought to be sulphur trioxide, and smoke is emitted through an outlet pipe at the top of the float.

The floats were tried out and gave a good smoke cloud, but difficulties due to corrosion may be encountered.



GERMAN VISUAL SIGNAL SYSTEM

7. GERMAN CHEMICAL WARFARE VEHICLES

a. General

The Germans have given much attention to the development of decontamination, gas-detection and smoke-generator trucks. Most of the equipment, as will be seen hereafter, is mounted on 1-and 3-ton half-tracks, some on medium heavy six wheelers, as illustrated in the accompanying sketches.

b. Bulk Contamination Vehicles

The Germans have developed two vehicles which form part of the equipment of contamination units. These vehicles are employed in spreading persistent agents. Each has a crew of one in addition to the driver. The spray is operated from a panel behind the driver's compartment and appears to be emitted from a jet on a swivelling arm at the top of the vehicle, the nozzle being fed by a flexible hose of small diameter hung on support arms. It is probable that the nozzle traverses in an arc, which would enable a wide zone to be sprayed; 100 grams (.22 lb) per sq. meter is the minimum degree of contamination considered effective by the Germans. One machine is 15 feet 3 inches by 5 feet 11 inches, 5 feet 9 inches high, weighs 4.5 tons, and is mounted on a 1 ton (Sd.Kfz* 10/3) (see figure 1) half-track; the other, (Sd.Kfz. 11/3) likewise mounted on a 1-ton half-track is 18 feet 2 inches long by 6 feet 7 inches wide, and 6 feet 11 inches high with a weight of 7.3 tons (see figure 2).

c. Decontamination Vehicles

Light and medium decontamination vehicles exist, which are mounted, respectively, on the 1-ton and 3-ton half-tracked chassis. In both cases the equipment carries a hopper at the rear, by which the decontaminant is distributed over the road or terrain requiring treatment. Between the driver's compartment and the hopper, eight large drums of bleach, for use in the hopper, are stacked. In addition to this, each vehicle carries 16 decontamination canisters, each holding 22 pounds of decontaminant, for use by hand on isolated areas. The crew of each vehicle is three men.

The light vehicle is Sd.Kfz. 10/2 (see figure 3). It is 15 feet 7 inches by 6 feet 1 inch and 5 feet 4 inches high, weighing (equipped) 4.8 tons. The medium vehicle is the Sd.Kfz. 11/2 (see figure 4). It is 19 feet long, 6 feet 7 inches wide and 7 feet 10 inches high. The battle weight is 6.7 tons.

According to a reliable report the medium vehicle carries 760 kilograms (1,675 pounds) of bleach; a strip 1.7 meters (5 feet 7 inches) wide and 1.4 kilometers (just over a mile) long can be decontaminated by using a density of 300 grams (0.66 lb) of bleach per square meter. The density at which the vehicle distributes decontaminant is independant of the vehicle speed, the maximum potential density is 600 grams (1.32 lb) per square meter.

*Sonder Kraftfahrzeug - Special Motor Vehicle

CHEMICAL WARFARE VEHICLES

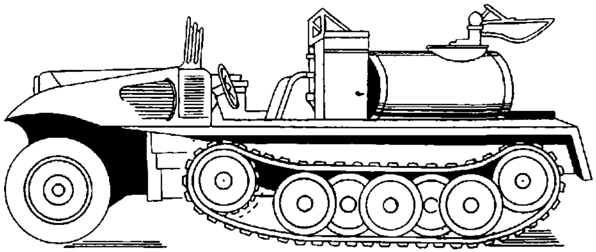


FIG. 1
LIGHT BULK CONTAMINATION VEHICLE
(Sd. Kfz. 10/3)

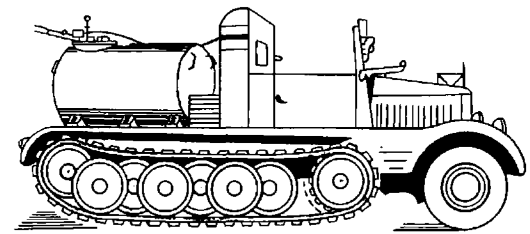


FIG. 2
MEDIUM BULK CONTAMINATION VEHICLE
(Sd. Kfz. 11/3)

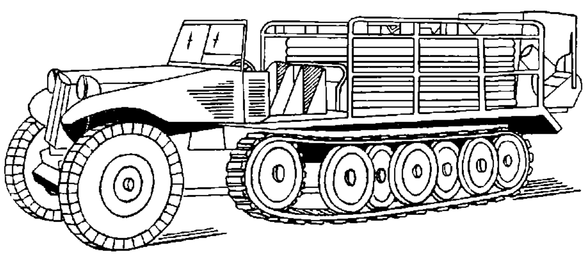


FIG. 3
LIGHT DECONTAMINATION VEHICLE
(Sd. Kfz. 10/2)

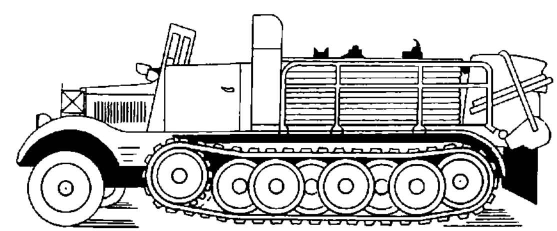


FIG. 4
MEDIUM DECONTAMINATION VEHICLE
(Sd. Kfz. 11/2)

24-23048

CHEMICAL WARFARE VEHICLES

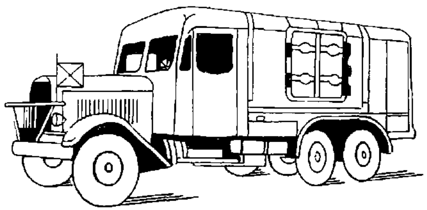


FIG. 5

VEHICLE FOR DECONTAMINATION OF CLOTHING
(Kfz. 93)

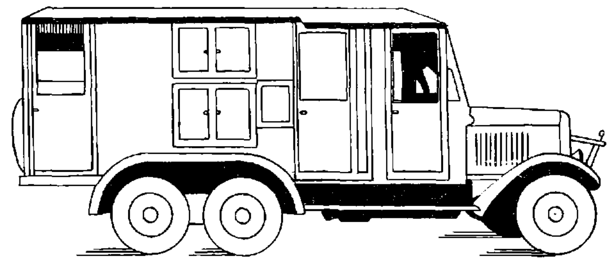


FIG. 6

VEHICLE FOR DECONTAMINATION OF PERSONNEL
(Kfz. 92)

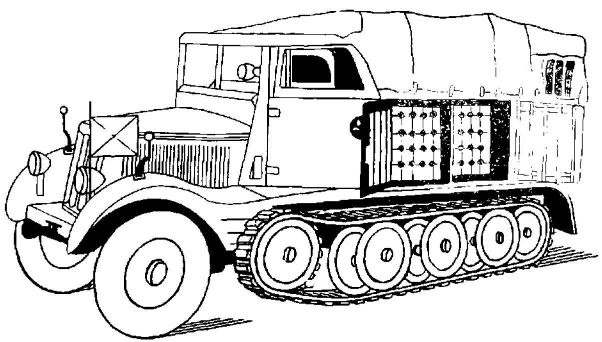


FIG. 7

SMOKE VEHICLE (Sd. Kfz. 11/1)

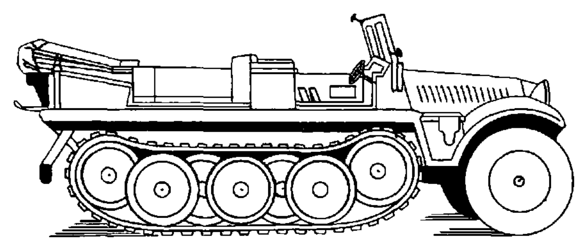


FIG. 8

GAS-DETECTION VEHICLE (Sd. Kfz. 10/1)

24-23048

d. Gas-Detection Vehicle (Sd.Kfz. 10/1)

This vehicle (see figure 8) appears to be very little different from the standard, light, 1-ton half-track. It is, in all probability, simply that vehicle fitted out to carry personnel of the gas scout section and their equipment.

e. Vehicle for the Decontamination of Personnel (Kfz. 92)

This has a large box body with doors just behind the driver's compartment and at the rear (see figure 6). No details are available on the internal fittings and equipment, but it is presumably some form of mobile bath. It is a 6-wheel, Henschel medium 9-ton truck, 23 feet 4 inches long by 7 feet 7 inches, standing 9 feet high.

f. Vehicle for Decontamination of Clothing (Kfz. 93)

This has a large, closed body with heavy doors at the center of the left side, giving access to the chamber in which contaminated articles are arranged for treatment (see figure 5). Decontamination may be carried out by steam or hot-air treatment, mixed with suitable chemicals where necessary. The vehicle is completely equipped with an oil-fired boiler, fans, water tanks, etc., necessary for the work. This machine, like the personnel decontamination truck, is a six-wheel Henschel 23 feet 3 inches in length, 8 feet 2 inches in width, and 10 feet in height, weighing 9.7 tons.

g. Smoke-Generator Vehicle (Sd.Kfz. 11/1)

A large part of the body of this vehicle (see figure 7) is taken up by what appear to be racks for smoke thermal generators or other munitions. There is, in fact, no evidence as yet that the vehicle is designed for more than the transport of smoke ammunition. This vehicle is a 7.3-ton half-track. It is 23 feet 7 inches by 8 feet 2 inches, and 8 feet 10 inches high.

ENGINEERS

8. GERMAN "S" MINES COMBINED WITH TELLERMINES

Minefields are reported which contain both Tellermines and "S," mines. At the risk of possible repetition, it seems worth while to point out here the difference between these two types, as engineers clearing Tellermines, if "S" mines are unexpectedly encountered, may be in a rather difficult situation.

The Tellermine ("Teller" is "plate" in German) is the standard antitank mine, a flat, round device looking not unlike a stack of wheat cakes. Unless booby-trapped with a supplementary pull, pressure, or release igniter, the Tellermine will ordinarily explode only when run over by a tank or other vehicle. Where pressure is equally distributed over the top of the mine, the weight required for detonation is approximately 400 pounds. However, if pressure is brought to bear on the edge of the mine, about 175 pounds is sufficient for detonation. The figures referring to pressure apply to mines buried at a depth of about 3 inches.

The antipersonnel "S" mine, otherwise known as the "bounding mine" or "silent soldier," is a much more ingenious device. Buried in a shallow hole, it is tossed into the air by a light charge of powder in its base, and explodes violently when some 5 feet up. In size, the mine is about as large as a quart tomato can. It weighs about 9 pounds, and the bursting charge of approximately 1 pound of TNT scatters some 350 steel balls with such surprising force that they are dangerous at 200 yards. Both trip-wires and direct step-on devices are used to ignite them.

9. GERMAN VIEWS ON RUSSIAN SUMMER CAMOUFLAGE

The following is a translation of a German pamphlet on Russian summer camouflage, printed in the spring following the German invasion of Russia in June 1941. The Germans evidently found Russian camouflage methods disconcerting, and some were apparently new to them. The great care the Russians apparently devote to camouflage training is worthy of note; their success in effective concealment seems to have resulted from ingenuity and strict camouflage discipline.

* * *

a. Preface

The following examples are taken from reports from the front and captured orders. They represent only a part of Russian camouflage methods, but are in some cases new and worthy of imitation. They can be used in improvised form by our own troops. A detailed knowledge of Russian camouflage and methods helps our own troops to recognize the enemy and his tricks without delay. In this way surprise is avoided and troops can operate with greater confidence.

b. Camouflage Material

The camouflage instinct is strongly developed in the Russian, and his inventive ability is astounding. This gift is systematically encouraged by thorough camouflage training which begins on the first day of military training and is continued throughout the whole period. Camouflage discipline is good even among troops who otherwise might be well below the average as regards weapon training. Infringements of camouflage discipline are severely punished.

(1) Prepared Camouflage Material

(a) Summer Camouflage Suit

The suit consists of a jacket and hood of green-colored material in which tufts of matting in various shades are woven. In appropriate surroundings, a man in a prone position in this clothing cannot be seen more than a few paces away.

(b) Summer Camouflage Smock

This consists of colored material with patches in dark shades, and is suitable for use with a broken background of woods and bushes.

(c) Camouflage Net for Rifleman

The net is about 5 by 2 1/2 feet and weighs about 1/3 pound. It is woven with natural camouflage material taken from the immediate surroundings and can be used either as a covering or spread out in front of the rifleman. By binding several nets together, rifle pits, machine guns, and entrances to dugouts can be camouflaged.

(d) Camouflage Mask for Rifleman

This consists of a wire contraption divided into several pieces, covered with material. In it is a hole through which the rifle can protrude. It represents a bush and is in use in three different colors. It can be folded up and carried on the person in a bag. The rifleman lies in such a position behind the mask that his body is fully hidden. In attacking he can move forward in a crouch and push the mask in front of him. The mask is only visible to the naked eye at a distance of 150 to 200 paces.

(e) Camouflage Cover for Machine Gun

The cover consists of colored fabric in which tufts of colored matting are woven. When moving forward, the cover will not be taken off. The machine gun with this cover can only be recognized when within about 100 yards.

(f) Camouflage Fringe

The fringe consists of a band about 3 yards long, from which grass-

colored matting is hung. On the ends are hooks for attaching the fringe on the object. The rifleman can fix the fringe on the helmet or shoulders. Five of these fringes are used to camouflage a machine gun, and six for an antitank gun.

(g) Nets

For covering gun positions and trenches, nets of various sizes are issued. The net is woven with shreds of matting or paper; when in use, additional natural camouflage is added, such as grass, twigs, etc. These nets are also used by tanks, tractors, trucks, and trailers. The standard net is about 12 feet square, and by joining several together, large surfaces can be camouflaged against aerial observation (see figure 1).

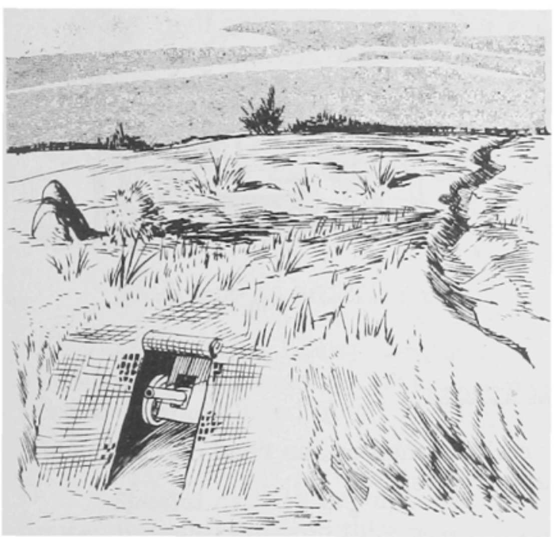


Fig. 1

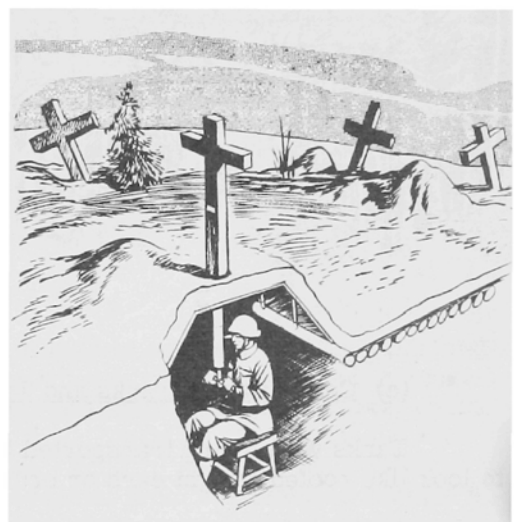


Fig. 2

(h) Camouflage Carpet

This consists of shreds of various sizes into which colored matting and tufts are woven. It is used mostly for camouflaging earth works.

(2) Improvised Camouflage Material

(a) Observation and Sniper Posts

A tree stump is hollowed out and stakes are used as supports. Another method is to insert periscopes into a frame made to look like wooden crosses in cemeteries (see figure 2). Imitation hayricks are often used.

(b) Camouflage Against Observation from the Air

Shadows can be cast by fixing frameworks on the side of a house or on the roof so that the object cannot be recognized. Branches fixed on wire strung over the object can make it invisible from the air (see figure 3).

Fig. 3

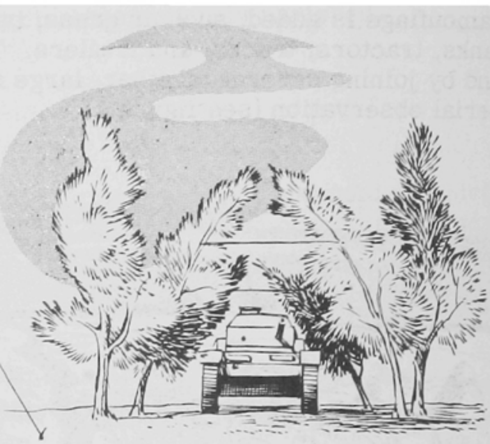


Fig. 4

(c) Camouflaging Tanks and Tank Tracks

Tanks when being transported by rail or when on the road can be made to look like roofed freight cars or ordinary trucks.

When there are groups of trees, camouflage can be quickly obtained by bending the tops of the branches over the objects to be camouflaged (see figure 4). Nets can also be spread over and attached to the trees, with natural material laid on top. Among low bushes, tanks can be covered with grass, moss, or twigs. Freshly cut trees, one-and-a-half times the height of the object to be camouflaged, complete the camouflage. Tanks on a slope can be effectively and quickly camouflaged by the use of netting or other covers. Tanks in hollows can be made invisible by covers and, even without natural camouflage, nets or covers can completely alter the shape of tanks.

Tank tracks can be obliterated by dragging a fir tree behind the tank; rolls of barbed wire with an iron rod through them can also be used for this purpose.

c. Use of Camouflage

(1) On the March

As equipment being transported by rail cannot be fully concealed, the

Russians attach particular importance to preventing the recognition of the type of equipment by making guns, vehicles, tanks, fuel trucks, etc., look like ordinary roofed freight cars. This is done by means of some sort of superstructure. Loading and unloading generally take place at night, often in open country.

Movement of large Russian units takes place either at night, with meticulous attention being paid to blackout regulations, or by day in wooded country. If the march must take place by day in country which offers only limited natural concealment, movement takes place by bounds from cover to cover. Motor vehicles are, where possible, diverted from main roads to side or wood roads. All bunching of vehicles on bridges, defiles, etc., is strictly avoided. A group of vehicles will halt under cover a distance from a defile; the movement through the defile will be made only by single vehicles or in small groups.

On the approach of German aircraft, vehicles of all descriptions take cover without delay. If single vehicles are forced to remain on the road, they either remain stationary, or, failing any camouflage protection, they take up positions diagonally on the road in order to look like broken-down vehicles.

Track discipline is carefully carried out. When tanks have to leave the main road, they travel in single column as far as possible so as not to give away their numbers by leaving many tracks.

(2) Quarters and Bivouacs

All evidence of the occupation of a village is avoided. Tanks, guns, and vehicles, if they cannot be brought under cover, are placed in irregular formations and camouflaged in yards and gardens, and against hedges, bushes, walls, and trees.

Special care is taken to see that movement from one place to another is limited to small groups; this rule applies also when issuing food, gasoline, etc.

Destroyed villages and burned-down premises are preferred for quartering men, weapons, equipment, and vehicles, as these areas lend themselves easily to camouflage.

Bivouacs are cleverly camouflaged against houses, hedges, gardens, etc. If possible, thick woods are used, and use is made of branches. In open country, hollows and ditches are used to the utmost, and bivouacs spread out in irregular formations. Tents are covered with natural camouflage material; if this is lacking, no use is made of tents. Instead, holes and pits are constructed. When bivouacs are taken up, tracks are obliterated in order to give the enemy no indication as to strength.

(3) Battle

Stress is laid on the necessity of being able to crawl for long distances at a quick pace. Patrols are well equipped with camouflage suits, and make full

use of darkness and bad visibility.

When working forward, the Russian moves in short, quick bounds, and is capable of moving through the thickest undergrowth in order to work his way close to the enemy position. If the defense is on the alert, he is able to lie still for hours on end.

Russian tree snipers are particularly difficult to recognize. Tank-destroying sections with Molotov cocktails, grenades, and mines, are distributed in wheatfields and at places several yards from the edges of woods and fields.

In defending built-up areas, the Russians make use of positions outside the area. These consist of many rifle pits, organized in depth and well camouflaged with fences and bushes. When firing from houses, machine guns are placed well back from windows and doorways to prevent the flash being seen, and also to smother the report.

When German aircraft appear, every movement ceases.

After firing, any discoloration in front of a gun is covered with suitable camouflage material. When the gun remains for some time in one position, a board of sufficient size, and colored to match the surroundings, can be laid in front of the muzzle.

As the presence of tanks leads to definite conclusions regarding the main effort of the attack, the Russians are very careful to camouflage their armor.

(4) Lay-out of Defense Positions

Reconnaissance patrols are instructed not only to study the ground from the tactical point of view but also as regards possibilities for camouflage. This includes shape of the ground formations, the background, the coloring, the available natural camouflage, and what suitable artificial camouflage material can be used. Positions are selected to conform to the natural contours of the ground, and comfort is of secondary importance. As much use as possible is made of reverse slope positions. Parapets are kept as low as possible and are carefully camouflaged with grass, etc. Positions are often camouflaged with covers made of boards, fir branches, or straw. If time does not allow, only single portions of the trench system will be covered, so that to an observer they look like connecting trenches. Provision is made to conceal vision slits. Antitank ditches are either entirely covered, or partially covered in such a way that they look like narrow, easily passable ditches (see figure 5, following page). Pillboxes are carefully camouflaged with nets or covers. The open walls are painted with a mixture of tar and asphalt, and covered with earth or hay. Wire obstacles can be made invisible by passing them through hedges and fences.

In woods, thick undergrowth is preferred in selecting a position. Cutting down trees to give fields of fire is avoided for reasons of camouflage.

Russian signalmen use telegraph poles, with the bark still on, and set them up at irregular distances. The line of poles is laid to conform with the country. Earth at the foot of the poles is carefully camouflaged, and trampling of the earth along the line of the poles is strictly avoided. Wire is also laid to conform with the general contouring.

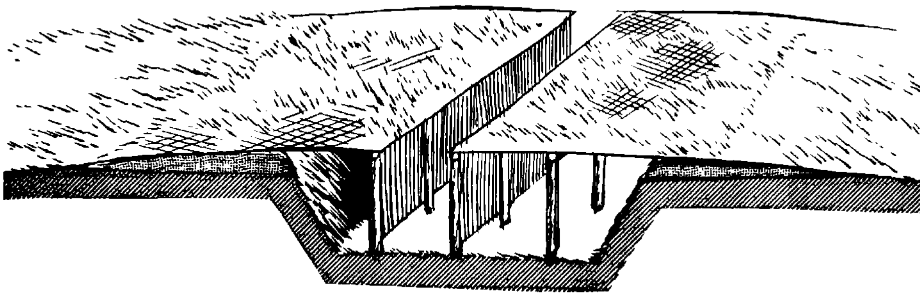


Fig. 5

Camouflage discipline in occupied positions is very good, and one seldom hears talking, rattling of weapons, or sees the glimmer of a cigarette. In order to prevent the enemy realizing that a position is weakly held, single riflemen keep up strong fire activity at various points.

d. Dummy Positions

The Russians often use dummy positions.

Dummy trenches are of normal width, but are dug only to a depth of about 1 1/2 feet. The bottom can be made dark with soot or pine needles. Dummy dugouts can be made by the use of props, with the entrance made of cardboard or paper. Dummy loopholes and observation slits can be made out of black paper or felt. Dummy gun positions can be arranged by turning over grass, or burning it in order to imitate discoloration from muzzle blast. Dummy gun positions must be at correct distances. The representation of dummy tracks leading to the dummy positions must not be forgotten. The desired result is achieved by mowing grass to the normal width of a track, and letting the mown grass remain, or rolling it. When the ground is open, color must be used in order to make the tracks light and trenches dark.

Dummy obstacles can be erected by mowing grass and making little heaps out of the cut grass. On a ploughed field, it is sufficient to plough at right angles to the furrows to the width of the particular obstacle it is desired to represent. Dummy mine pits can be made by taking out sods of turf and laying them down clumsily. The dummy minefields should be two to four times as obvious as the normal. In dummy minefields 5 to 10 percent of live mines are generally laid. Dummy light installations are used a great deal in order to portray a station, industrial plant, or airfield. Lanterns, dummy bivouacs, and camp fires are often arranged to give the impression of the presence of troops.

INFANTRY

10. SOME GERMAN BATTLE OBSERVATIONS ON THE RUSSIAN FRONT

Below appears a translation of a German document discussing in outline form one of their later Russian offensives.

* * *

a. Preparation

Detailed preparation for the attacks was made possible through the constant collection of information dealing with previous actions, exchange of information between various headquarters and distribution of this information down to companies. Preparations included rehearsals over similar ground and under similar conditions; also, measures to deceive the enemy.

b. The Attack

The attack was carried out by surprise, with no artillery registration or preparation. The attack opened with coordinated fire on a narrow front from artillery and all smoke mortars and heavy weapons available. As success depends upon speedy removal of obstacles in depth, especially minefields, strong engineer elements were allotted to the leading elements. Cooperation with the air force was close. Flight schedules were arranged to leave sufficient time for refueling and resupply of ammunition. To avoid bombing of friendly troops, the air force was kept closely informed of the positions of troops on the ground by the aid of air-force liaison officers, and by ample supplies of cloth panels, etc.

c. Minefields

Minefields were quickly crossed by reconnaissance and by mine-detector sections, pushed well forward to mark the lanes. Mine-clearing sections rapidly widened the lanes through the fields from 5 to 10 meters. Two lanes were made for each company sector.

d. Observations

(1) Whenever strong tank attacks were launched, the Russians coordinated the fire of all available antitank guns, and antiaircraft guns in an antitank capacity.

(2) The Russians would often let our attack come so close that our artillery could not continue to fire. Heavy weapons were therefore pushed well forward for use against positions where such tactics were expected.

(3) Mass formations had to be avoided in favor of organization in depth.

(4) When signal communications had not been set up, traffic difficulties were encountered between responsible headquarters.

(5) The use of the Fieseler Storch (a small liaison and command plane capable of landing and taking off in a very small space) was necessary for commands responsible for observing the battle situation and directing traffic.

11. GERMAN VIEWS ON RUSSIAN TACTICS IN WOODS

Much thought has been devoted to the tactics employed by the Japanese in the close jungle country of the southwest Pacific areas. Of particular interest therefore is the following brief extract from a German training pamphlet.

* * *

The terrain of the Eastern Front and Russian methods of fighting are both such that battles have often to be fought in thick, marshy, and extensive woods. To overcome their nervousness of woods, officers and men must be trained in forest fighting, a training which serves equally as training for fighting by night or in fog.

The following is an account of some lessons learned in fighting on the Russian Front.

When fighting in woody or marshy terrain, the Russians show their greatest powers of resistance. Here, their superiority of numbers, cunning and skill at camouflage stand them in good stead. They are adept in the use of ground, in the use of trees for observation and as sniping posts, and at erecting field fortifications in woods. They deliberately seek out woods for purposes of approach and defense; by holding their fire, they entice the enemy to approach within a short distance and come to grips in close-quarter fighting. Despite the thickness of the undergrowth and the density of the trees, they even strengthen their defense with tanks, and attack against them then becomes difficult and costly.

The Russians tend to make great use of the edges of woods, and in particular to concentrate heavy weapons and antitank guns at points where trails and roads enter the woods. The Russians do not surrender even when the woods may be surrounded. They must, therefore, be attacked and destroyed within the woods.

Lines of communication which run through woods, even when they may be behind the front, are particularly precarious. When they retreat, the Russians leave detachments behind in woods. These detachments, reinforced possibly by others dropped from planes, form partisan bands for the special task of harassing the enemy and of interfering with his rear communications. The mopping up of woods which may have been occupied by partisan or other dispersed groups of Russians demands much time and the planned use of sufficient forces. Merely to comb out roads that may run through woods is fruitless and costly, for the Russians disperse off the roads into the woods.

12. FIGHTING ON THE KOKODA TRAIL IN NEW GUINEA

Direct reports from the front are always worth reading. Even if there is some repetition of detail, the repetition itself drives home important lessons. The notes that follow were sent in by a U. S. Army Colonel.

*   *   *

In the fighting on the Kokoda Trail, (between Port Moresby and Buna) our troops found that on making contact along a road or trail in the jungle, the Japanese usually followed this procedure:

An especially trained advance guard pushed ahead of their column, took up a position astride the trail, and tried to pin down our defense with machine-gun and mortar fire. Next, if various feints and demonstrations did not induce us to give away our position by opening a premature fire, the Japs would try to infiltrate around the flanks. Their groups moved swiftly under cover; targets were poor and fleeting. If our troops held their fire till a good target presented itself, these forward groups could usually be stopped. There were many cases where, when the advance elements were allowed to sneak by, the supports which followed them could be ripped up by machine-gun and rifle fire. However, if the defense disclosed its position by too early or too powerful a fire, the Japanese brought up machine guns and mortars and blasted our lines.

To test the possibility of further advance, the Japanese used many tricks based on two natural human traits - fear of the unseen and unknown, and curiosity. They appeared to place much confidence in the effect of noise, and for this reason did considerable firing, both to bolster their own courage and to lower our morale. Captured weapons were shot off to give the impression that our men were firing them; they fired machine guns out on the flank to give the impression that our position was being

turned; or they talked loudly and shook bushes to draw nervous shots or cause movement. In order to distract attention and cause confusion, they exploded fire-crackers.

There must be depth to positions in order to prevent effective encirclement, and bold handling of combat patrols to meet their flanking tactics. The counterattack cannot be overstressed. All-around defense, at night,or in thick country, is necessary.

In their attack on prepared positions, the Japanese used a more or less standard procedure. By reconnaissance and ruses, they made every effort to determine our strength and location. After they had discovered what they thought was a soft spot, they persisted in attacking there. Should the first attack fail, it was shifted to some other place, but the Japanese usually returned again to the original point of attack. Consequently, it was dangerous to weaken that point to reinforce some other.

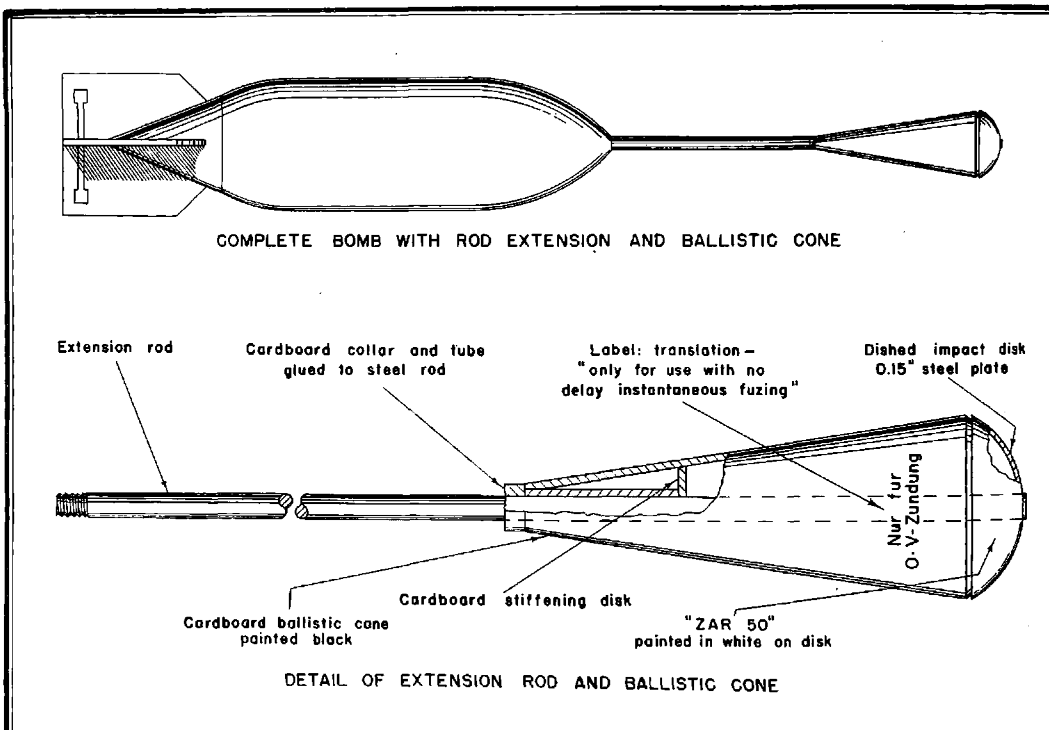
Often, in this phase of the fighting, the Japanese used no preparatory fire. After contact was made, their skirmish line hit the ground while overhead fire by machine guns and mortars fell on our positions. Under cover of the barrage, supports would try to crawl close enough to put down a hand-grenade barrage to protect the advance. It was not uncommon during such attacks for the enemy to replace tired forward troops with fresh reserves. This change-over was accomplished efficiently, and without confusion. *Incidentally, the Japanese will advance under a white flag and shoot at anyone coming out, disguise himself as a native or a civilian, and in retreat, litter the trail with cast-off garments and equipment to give the impression of a disorderly flight, and then ambush the pursuit.

* The description of these skirmish line tactics corresponds closely with accounts of Indian fighting in Kentucky and Ohio in Daniel Boone's day.

ORDNANCE

13. GERMAN BOMB WITH NOSE EXTENSION ROD

While the German airplane bomb usually detonates below the ground level forming a crater, and permitting persons in the vicinity to get some protection by lying down, a new type of bomb with an extension rod screwed into the nose to give a "daisy-cutter" air-burst has been discovered in Libya. Against such a bomb, both vertical and horizontal cover is needed. There is evidence that similar rods are used in the 250-kilogram (550-lb), 500-kilogram (1,100-lb), and 1,000-kilogram (2,200-lb) bombs in attacks on buildings and small craft.



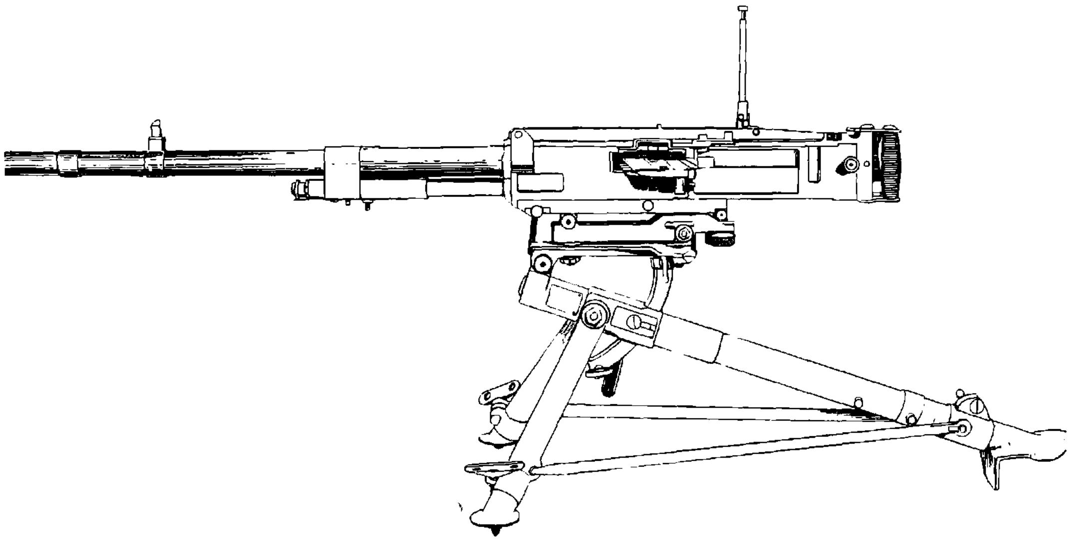
The rod adapted to a 250-kilogram bomb, shown in the accompanying sketch, lacked a cardboard ballistic cone, but there is no doubt that one was fitted to it. From Malta have come reports of "dumbbell bombs," and probably bombs fitted with these rods would have such an appearance when viewed from the ground while falling, particularly if they wobbled a bit.

14. ITALIAN 8-MM BREDA MEDIUM MACHINE GUN, MODEL 37

a. General

This machine gun is not dissimiliar to the French Hotchkiss, with the exception of the thumb trigger, like the British Vickers. From the following report, prepared at the Aberdeen Proving Ground, it appears to be an excellent gun.

The gun is gas-operated, air-cooled and has a quick-change barrel. The cartridges are fed from plate chargers holding 20 rounds, each round being housed in a separate compartment (see sketch). After firing, the empty cases, instead of being ejected, are replaced in the compartment of the plate charger.



BREDA MG, MODEL 37

The gun uses ammunition very similar to our own with the exception of the case which is shorter and the caliber which is .015 of an inch larger. It is made in ball, tracer, and incendiary tracer armorpiercing. The German 7.92-mm ammunition can also be used.

b. Description

Following are characteristics of this gun:

Caliber	8 mm (.315 in)
Weight	44 pounds
Length over-all	50 in
Weight of barrel, complete	17-3/4 pounds
Length of barrel, complete	33-1/4 in
Rifling	4 lands, right hand twist
Rear Sight:	
Elevation	300 to 3,000 meters
Windage	0 to 8 mils plus or minus (0 to 2-1/4° plus or minus)
Cyclic rate of fire (maximum)	450 rounds per minute*
Effective rate of fire	Unknown
Muzzle velocity	2,600 feet per second*
Maximum range	6,500 yards*
Cooling	Air
Mounting	Tripod
Feed	20-round plate charger
Provision for single-shot fire	None
Safety	Shift safety catch on top of rear cross-piece to S for "safe" and to F for "fire".

The accompanying range table covers the Breda Model 37 and also the Fiat Model 35.

c. Tripod Mount

The mounting is provided with elevating and traversing gears, which can be used in conjunction with the open sights for direct laying, or with the elevating and traverse scales for indirect laying.

Elevation is adjustable from 360 mils (20 degrees) depression to 360 (20 degrees) elevation, with a micrometer adjustment from the 46 mils (2 degrees 30 minutes) depression to 36 mils (2 degrees) elevation.

The main traverse scale is graduated from 450 mils (25 degrees) to 1,150 mils (65 degrees) in 10 mil steps, the central position being at 800 mils (45 degrees). An additional 150 mils (8 degrees 30 minutes) traverse is provided by an independent micrometer adjustment.

Comment: The gun is quite simple in its operational features, and is extremely easy to disassemble. The breech is positively locked at the moment

*This information has not been checked by U.S. test.

RANGE TABLES FOR ITALIAN 8-MM MGs--FIAT MODEL 35 AND BREDA MODEL 37,
FIRING MODEL 35 BALL AMMUNITION

Range (yds)	Fiat 35 Elev. (mils)	Breda 37 Elev. (mils)	Range (yds)	Fiat 35 Elev. (mils)	Breda 37 Elev. (mils)	Range (yds)	Fiat 35 Elev. (mils)	Breda 37 Elev. (mils)	Range (yds)	Fiat 35 Elev. (mils)	Breda 37 Elev. (mils)
100	1	1	1200	19	19	2300	68	66	3400	150	148
200	2	2	1300	22	22	2400	74	72	3500	159	158
300	3	3	1400	25	25	2500	80	78	3600	168	168
400	4	4	1500	29	28	2600	86	84	3700	178	179
500	5	5	1600	33	32	2700	93	91	3800	188	190
600	6	6	1700	37	36	2800	100	99	3900	199	202
700	8	8	1800	41	40	2900	108	107	4000	210	214
800	10	10	1900	46	45	3000	116	114	4100	221	226
900	12	12	2000	51	50	3100	124	122	4200	234	239
1000	14	14	2100	56	55	3200	132	130	4300	247	253
1100	16	16	2200	62	60	3300	141	139	4400	261	266

Standard conditions: barometer 750 mm (29.5 in) of mercury, temperature 15° C (59° F), humidity 0.5 (half-saturated air).

of firing, the breechblock being forced up (without tilting) by the action of inclined surfaces on the piston extension, so that a projection on its upper surfaces engages in an opening in the top of the body. The barrel is sufficiently heavy (17-3/4 pounds) to enable it to fire a large number of rounds in quick succession without overheating.

QUARTERMASTER

15. GERMAN CONVOY-CONTROL SIGNALS

The following is an extract from German rules for convoys in the desert.

* * *

a. To Vehicle Following:

Blue flag waved	Caution - difficult country
Blue flag held straight out	Stop where you are until I have reconnoitered
Red flag held straight out	Come on

b. To Vehicle in Front:

Blue flag waved	You're driving too fast - can't keep up
Blue flag held straight out	Am stopping - bad going or breakdown
Red flag held up	Have stopped for a moment but need no help

SECTION II

GERMAN CLOSE-IN TACTICS AGAINST ARMORED VEHICLES

GERMAN CLOSE-IN TACTICS AGAINST ARMORED VEHICLES

The following is a translation of a German document issued early in 1942. While some of the methods of attack discussed may have since been altered, it is thought that it reflects the essentials of current German doctrine. The preface explains the scope and purpose of the document.

* * *

Current Instructions For Close-in Tactics Against Armored Vehicles

Preface

These directives are based on experiences of the German Army in close-in combat against Russian tanks on the Eastern Front. The Russian tactics so far as known have been taken into consideration.

New doctrines of our own are in process of development and will be available to the troops after completion, together with directions as to their use. First, the Eastern Army will be equipped with incendiary bottles. Presumably the troops at the front use means of fighting about which, at the time of publication of these directives, no description is yet at hand. In addition, new enemy methods will appear, which will be adapted to our own fighting.

These directives, therefore, present only preliminary instructions. Co-operation of the troops in the field is needed for their completion. To this end, new fighting practices of our own and of the enemy should be reported, with drawings and descriptions of battle conditions at the time. Communications should be sent through the service channels to the General of Infantry and to the General of Mobile Troops in the Army High Command.

The importance of close-in fighting against tanks makes it imperative that individual tank hunters be trained immediately in <u>all</u> the arms. The state of training in the Reserve Army will be tested by recruit inspections.

These directives apply to combat against all kinds of armored vehicles. For simplification, only tanks are mentioned in the text.

I General

1. If there are no armorpiercing weapons at hand, or if their fire does not show sufficient result against attacking tank forces, specially trained, organized, and equipped tank hunters will have to assault and destroy tanks by <u>close-in combat</u>, making use of their special assault weapons and without waiting for specific orders. All other available arms will lend their support as strongly as possible.

Experience proves that with proper training and skilled use of close-in weapons, all classes of tanks can be destroyed by <u>individual</u> soldiers.

2. Close-in combat against tanks demands courage, agility, and a capacity for quick decision, coupled with self-discipline and self-confidence. Without these qualities, the best combat weapons are of no use. Proper selection of personnel is therefore of decisive importance.

3. Thorough knowledge of enemy tank types and of their peculiarities and weaknesses in battle and movement, as well as complete familiarity with the power and use of our own weapons in every terrain, is necessary for successful combat. This will strengthen the self-confidence of the troops. It will also make up the crucial points in training.

4. Close-incombat against tanks may be necessary for all situations and all troops.

In the first place the combat engineers, and tank hunters are the mainstays of this type of fighting. It must be demanded that each member of these arms master the principles and weapons of close-in antitank combat, and that he use them even when he does not belong to an antitank squad.

5. Over and above this, soldiers of all the armed services should be selected and grouped into close-in tank-hunting squads consisting of one leader and at least three men. They must continually be ready for close-in combat with tanks.

Where special close-in weapons are not at hand, expedients should be devised.

Combining tank-hunting squads into tank-hunting groups may be useful under certain conditions.

6. The equipment for close-in tank hunting consists of the following: incendiary bottles and Tellermines, TNT, automatic weapons (our own or captured), submachine guns, Very pistols, hand grenades, smoke bottles, and camouflage material, as well as hatchets, crowbars, etc., to use as clubs for the bending of machine-gun barrels projecting from the tank. Of this equipment the useful and available weapons for blinding, stopping, and destroying the tank should always be carried along. In the interest of maximum mobility, the tank-hunting soldiers must be free of all unnecessary articles of equipment.

II Combat Principles

7. Careful observations of the entire field of battle, early warning against tanks, as well as continuous supply and readiness of tank-hunting equipment of all kinds and in ample quantity, will insure against surprise by enemy tanks and will permit their swift engagement.

8. It should be standard procedure continually to observe the movements and the action of tank-hunting squads and to support them by the combined fire of all available weapons. In this connection, armorpiercing weapons must direct

their fire on the tanks while the remaining weapons will fight primarily against infantry accompanying the tanks. It will be their mission to separate the infantry from the tanks.

Sometimes tanks carry infantrymen riding on them, who protect the tanks at forced or voluntary halts against the attack of tank hunters. These security troops must be destroyed by supporting infantry before the tank hunters attempt to assault the vehicles. Should the tanks arrive without infantry, the fire of all the available weapons will be concentrated against the vulnerable places of the tank. The shorter the range and the more massed and heavy the fire, the greater the physical and moral effect.

Fire by sharpshooters is always of special value.

The activity of tank-hunting squads should not be hampered by the supporting fire. The mission of such supporting fire is to split up tank forces, to blind and put the crews out of action, and to have a demoralizing effect on them, thereby creating favorable conditions for close-in assault.

In case fire support by other weapons is impossible, the attack by tank-hunting squads must proceed without it.

9. The basic principles of close-in assault are the same in all battle situations. In defense, knowledge of the terrain and of the time available will be profitable for the preparation and the attack.

10. The carrying out of close-in combat will largely depend on the immediate situation. The number, type, and tactics of the attacking tank force, the terrain, our own position, and the effect of our own defensive fire will always vary, and this variation will demand great adaptability and maneuverability on the part of our tank hunters.

11. Only one tank can be assaulted by a tank-hunting squad at one time. If several tanks attack together and if only one tank-hunting squad is available, then that tank is to be assaulted which at the moment appears as the most dangerous or whose engagement promises the quickest success. In general, the choice must be left to the tank-hunting squad.

If there is a sufficient number of squads available, it is advisable, particularly in defense, to hold one or more squads ready in the rear for the destruction of tanks which may break through.

12. Generally speaking, the procedure will always be: first, to blind the tank, then to stop it, and finally to destroy the vehicle and the crew in close-in combat.

13. Whether the tank-hunting squads advance at the beginning of a tank attack or whether they leave their foxholes only during the engagement or whether the whole assault goes on from under cover depends entirely on the situation.

The behavior of the squads depends on whether the tank is moving or is voluntarily or involuntarily halted.

The attack on a heavy or super-heavy tank will often be easier than on a light tank, because the former in general is clumsier and has poorer observation. But the destruction of heavy tanks generally demands the use of more powerful weapons.

14. It is important in every case to make full use of the dead space around each tank.

In general, tanks should be attacked from the side or the rear. Any moment of weakness of the enemy tank should be utilized (i.e., impeded vision, halts, climbing and overcoming of obstacles, etc.).

15. Tanks should be approached by crawling and stalking, making full use of cover and concealment.

16. The foxholes of tank hunters must be narrow and have steep walls. They must be built without parapets and must not be recognizable by enemy tanks. They may be camouflaged either by canvas strips or branches. Whenever possible they should be protected by a belt of mines.

17. The tank hunters will remain motionless in their foxholes observing their targets and waiting in readiness for the favorable moment to assault. They must face the enemy tank calmly and must have the nerve to "let it come." It is always wrong to run away. While moving, the single soldier is inferior to the tank. In hiding, on the contrary, he is usually superior. He is safest inside the dead area around the enemy tank.

In villages, close-in assault of tanks is usually easier than in open terrain because of the abundant possibilities for hiding and cover (as by roof-snipers).

Often the corner of a house, a bush, or a fence are sufficient as hiding places.

By the use of obstacles of all kinds, dummy mines and guns, and signs like "Warning -- mines!", enemy tanks may be guided into terrain unfavorable to them, but favorable for the assault squads and antitank weapons.

18. When attacking moving tanks, the tank hunters at first must be well concealed and permit the tank to come close to them (7 to 20 meters); then they try to stop the tank by blinding it, or at least they force it to slow down. A strong blinding effect is obtained through the massed fire of all weapons. By using explosive charges, tank hunters destroy the tracks of the tank and cripple it. They will then assault it and destroy it and its crew with their close-in weapons.

In the case of halted tanks, the squad stalks up on it using the terrain to its best advantage.

19. Around every tank there is a dead area which it cannot cover with its principal weapons. The higher a tank, the larger, usually, is its dead space. In general, this space has a radius of about 20 meters (see figure 1). To combat

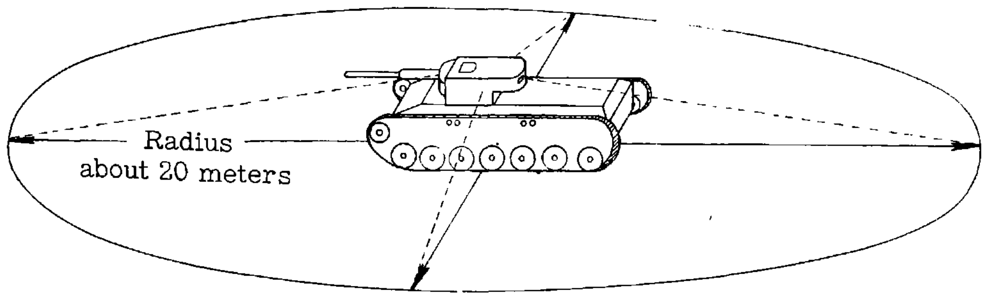


Fig. 1

targets in the dead space, tanks have slits through which pistols and submachine guns can be fired. Frequently a machine gun is found on the rear side of the turret.

When assaulting a tank, the tank hunters must make use of the dead space. They should approach the tank from the direction which is opposite to the direction of its principal weapons. This is also opposite to the direction of its principal observation (see figure 2). Should this approach be impracticable

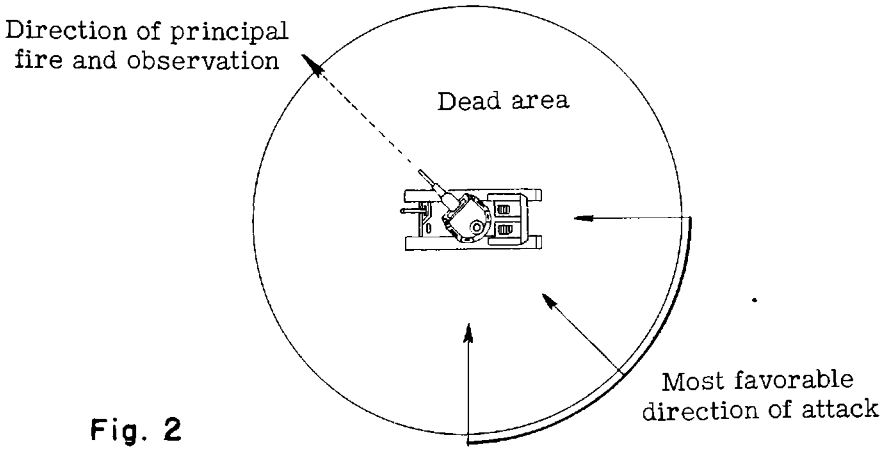


Fig. 2

because of a machine gun in the back of the turret, the squad will attack from the side or diagonally from the rear.

20. The tank hunter with the principal close-in weapon will use it against the tank while the other tank hunters support him with their fire. Should he be impeded by that fire, it must cease. When the crew of the tank becomes aware of the assault, they will open the turret hatch so as to defend themselves with hand grenades. That instant will be used by the observing tank hunters to fire against the open turret and to wound the crew. Crews of stalled or burning tanks who do not give themselves up when getting out will be destroyed in close combat. If the tanks are still undamaged, they are made useless by removal of the breech-blocks, by destroying the machine guns, and by setting fire to the gasoline tanks.

21. Neighboring units support the attack by rifle and machine-gun fire against the vision slits of the attacking tanks as well as against accompanying infantry which might endanger the tank hunters. The tanks are blinded and prevented from taking accurate aim, and the enemy infantry is forced to take cover. Weak places of the tank are taken under fire with armorpiercing ammunition and antitank weapons. Lead-sprays entering through the shutters into the inside of the tank will wound the crew. The cooperation of the tank-hunting squads with other troops in the area must be previously arranged, and all signals decided upon.

III Close-in Combat Weapons and Their Use

22. There are several kinds of short-range media (blinding, burning, and explosive) which allow many variations of use. The type of armored vehicle, its position, and the terrain determine which of the available weapons are to be used, or if several should be combined. The leader of the tank-hunting squad will have to decide quickly which medium to adopt under the circumstances.

According to the doctrine "Blind, halt, destroy," the tank-hunting squad has to be equipped with blinding, explosive, and incendiary materials. Explosives have the double purpose of stopping and destroying the tanks.

Blinding Agents

Smoke Candles and Smoke Grenades

23. Smoke candles or several smoke hand grenades, thrown in front of the tank with allowance for wind direction, minimize its vision and force it to slow up.

Smoke

24. Common smoke is used like smoke from candles. To be able to obtain it at the right moment, distribute straw or other highly inflammable material in the probable avenue of approach, drench it with gasoline or kerosene, and ignite it with signal rockets at the approach of tanks.

The detonation of grenades and artillery shells also creates clouds of smoke. Moreover, the firing of armorpiercing grenades against the vision slits promises success.

25. When smoke is used, the tanks are hidden also to our antimechanized weapons, and they are unable to aim accurately. Therefore, smoke should be used only when the vehicles have come so near that they cannot be covered by fire any longer without endangering our own troops, and therefore have to be destroyed at close range.

Signal Rockets

26. Signal rockets shot against vision slits have a blinding effect, particularly at dusk and in the dark; also, the vehicle is illuminated for our antitank weapons. Note that signal rockets only begin to burn at a distance of 25 meters.

Covering of Vision Slits

27. For this purpose one man jumps onto the tank, preferably from the rear, or approaches the tank closely from the side, and covers the vision slits or periscopes with a blanket, overcoat, shelterhalf, etc., or applies mud, paint, or grease. This is possible only if the tank is moving slowly or is halted, and if it is not protected by the fire from other tanks or following infantry. Any tank crew will be strongly demoralized by the presence of an enemy on top of their tank.

Incendiary Agents

Flame-throwers

28. Flame-throwers are aimed at vision slits, weapon openings, ventilators, and engine cover.

Incendiary Bottles

29. Incendiary bottles are a combat weapon used against tanks, armored scout cars, and other cars. In street and house fighting, they can also be used against living targets. They are thrown against the front part of the tank for blinding purposes, over the engine for incendiary purposes.

The contents of an incendiary bottle (not self-igniting) are 2/3 gasoline and 1/3 fuel oil. Ignition of the incendiary bottles takes place (when it has broken after hitting a hard surface) by the use of special safety matches.

The incendiary bottles are packed in wooden boxes in damp sawdust. The boxes also contain adhesive tape for fastening the matches to the bottles. The safety matches are packed in batches of twenty with 3 scratch pads in containers of noninflammable material. Two safety matches are taped to the bottle. The heads of the safety matches can be pointed either toward the neck or to the

bottom of the bottle (see figure 3). The matches are lighted immediately before throwing the incendiary bottle, by friction with any rough surface or the match box. See that both matches are burning properly.

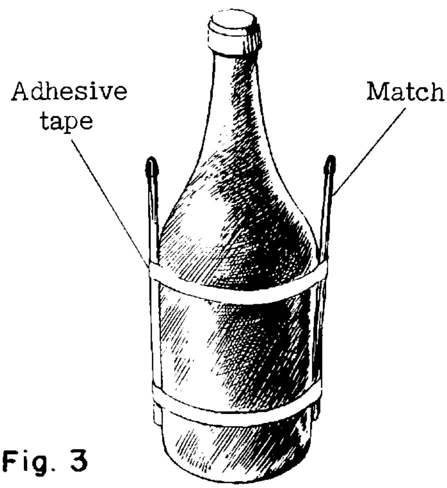


Fig. 3

The bottles can be thrown in two different ways; throwing by swinging the arm, holding the bottle at the neck (see figure 4), or throwing by pitching, like putting a shot, grasping the bottle at its heaviest point (see figure 5, following page).

Either of the two ways is practicable. In general, the position of the thrower will determine the type of throw. In a prone or similar position he will not be able to swing his arm, and therefore will have to pitch it. Whenever possible it should be thrown like a stick hand grenade, because the accuracy of aim is greater and the possible range will be increased.

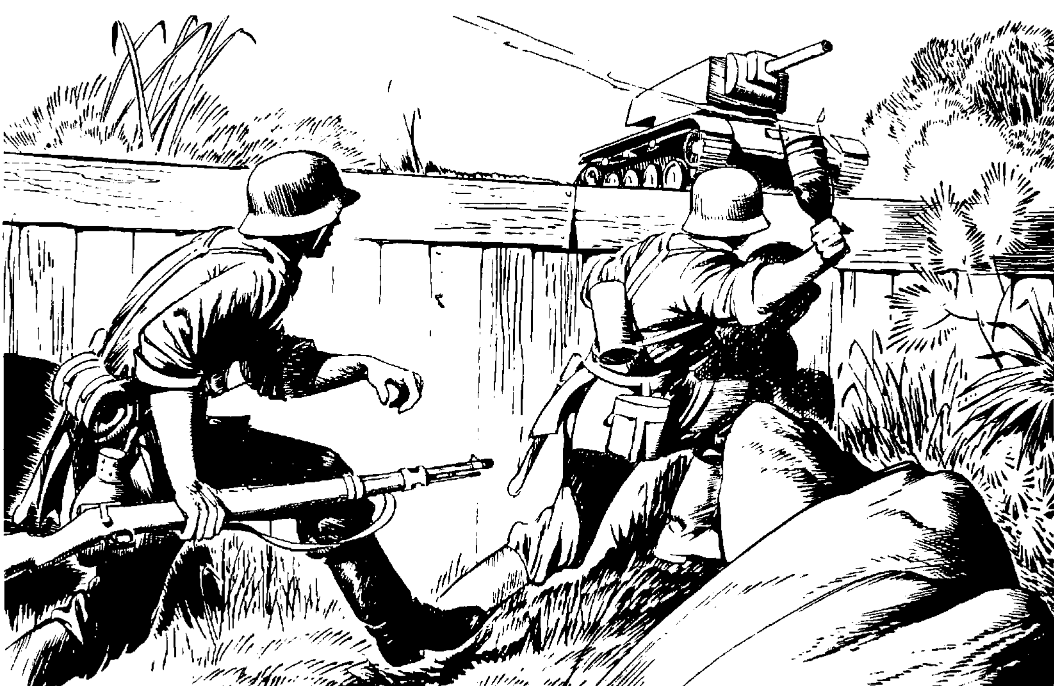


Fig. 4

The most vulnerable parts of a tank are: the engine (ventilation -- on tanks usually in the rear), the vision slits, and imperfectly closed hatches.

Should an incendiary bottle miss and remain intact, it is better to leave it until the matches have burned out, as the heightened pressure might cause an

Fig. 5

explosion. The bottles should be handled with care. They should not be bumped together or against hard objects.

Improvised Incendiary Bottles

30. Any bottle can be filled with an inflammable liquid, preferably mixed with wool fiber, cotton, or torn rags. A good mixture is two-thirds gasoline and one-third oil. Note that Flame-oil #19 is not freeze-proof. A mixture of gas and fuel oil can be used instead.

To ignite it, the bottle is equipped with an improvised lighter. It is constructed in the following way:

A wick is passed through a hole in the cork of the bottle, so that one end hangs in the liquid. To the free end are attached several matches. Several wicks may also be used without the cork, if they completely close the opening

of the bottle and are well drenched in the fluid (see figure 6).

At the approach of the tank, the wick is lighted and the bottle thrown. When it breaks, the fluid is ignited by the wick and is distributed over the tank and its engine. Generally the tank catches fire. If further bottles are thrown

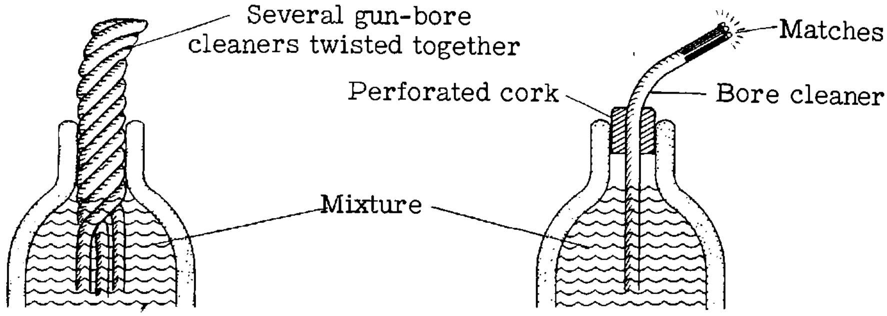


Fig. 6

against the tank, they do not have to be ignited before throwing. Even initially a bottle without an ignition device can be used. After breaking the bottle on the tank, the liquid can be ignited with signal rockets, hand grenades, smoke candles, smoke grenades, burning torches, or burning gasoline-drenched rags.

Captured Enemy Incendiary Bottles

31. Bottles with a self-igniting phosphorus mixture (so-called Molotov cocktails) are used as explained in paragraphs 29 and 30. If large numbers of these weapons are captured, they should be collected and reported, to enable distribution among as many troops as possible.

Gasoline

32. Several quarts of gasoline are poured over the engine housing of the tank, and ignited as in paragraph 30. Gasoline can also be poured into a tank. It is then ignited by a hand grenade which is also pushed in.

Hand Grenades

33. Quite frequently an enemy is forced to open the hatch for better observation. This opportunity can be used to throw grenades in a high arc into the interior of the tank. The crew can thus be eliminated and the tank set afire. Sometimes it may be possible to open the hatches with crow bars or bayonets and throw grenades into the interior.

Smoke Candle or Smoke Grenade

34. When thrown (as in paragraph 33) into the interior of the tank, they start the tank burning, or at least force the crew to get out because of the thick smoke.

Signal Rockets

35. Signal rockets shot into open hatches with a Very pistol can also start a tank burning.

Explosives

Hand Grenades

36. Several hand grenades can be combined into one concentrated charge (see paragraph 38).

One-Kilogram Blasting Slab

37. A slab of 1 kilogram [2.2 pounds] of explosive, placed on top of a tank, has about the same strength as a concentrated charge of 7 hand grenades and gives the crew a severe shock. Two such concentrated charges damage the turret hatch considerably and for a short time make the crew unable to fight because of the high concussion. Two or three such charges combined into a multiple charge can so severely damage the tracks of tanks that they will soon break under use. Even better are two such concentrated charges combined into an elongated charge. For this purpose, two to three 1-kilogram charges are tied to a board with wire and equipped with a short piece of fuze (see figure 7).

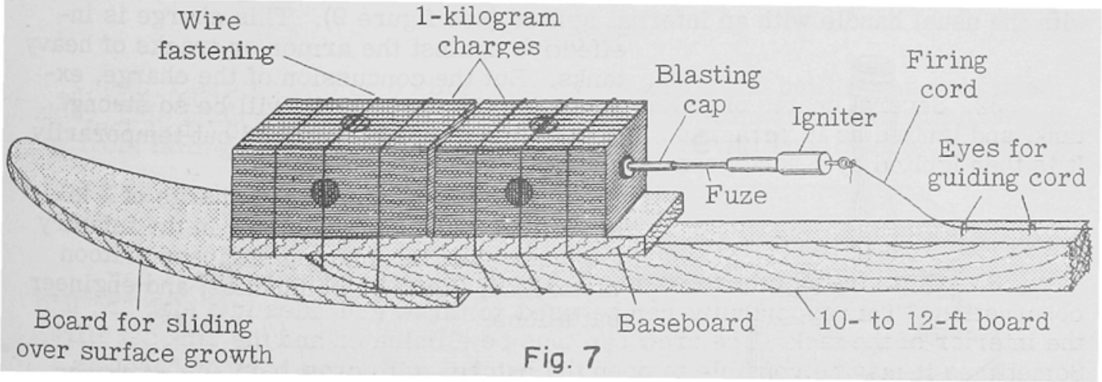


Fig. 7

Fasten igniter system firmly to the charge.

To destroy machine-gun and cannon barrels protruding from the tank, two 1-kilogram charges are tied together, hung like a saddle over the top of the barrel, and detonated (see figure 8). Machine-gun barrels are torn by the ex-

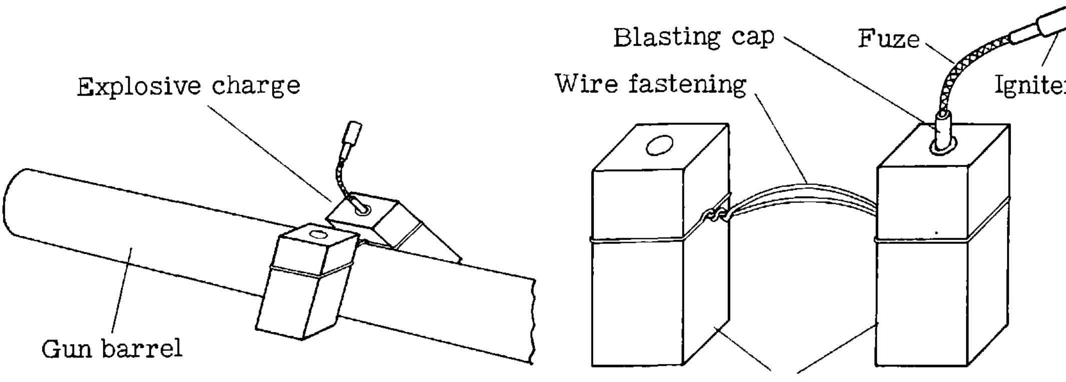


Fig. 8

plosion, and cannon barrels bent sufficiently so that an attempt to fire the gun will completely destroy it. Inserting hand grenades into the muzzle of the guns also has good results against cannon and crew. Shells will also burst in the barrel if stones, wood, or earth are rammed into it. Placing hand grenades in the vision slits is also effective.

Several 1-kilogram charges can be tied together as a field expedient in case of lack of finished multiple charges.

Concentrated Charges

38. The bodies of seven stick grenades are tied together securely with wire so that they will not fall apart when used. Only the middle grenade is fitted with the usual handle with an internal igniter (see figure 9). This charge is ineffective against the armor or tracks of heavy tanks. But the concussion of the charge, exploded on top of the tank, will be so strong that the crew will be knocked out temporarily.

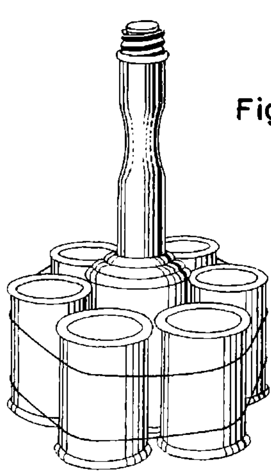


Fig. 9

39. The concentrated charge of 3 kilograms, is found ready for use in the infantry engineer platoon, infantry engineer platoon motorized, engineer companies, and engineer battalions.

It will pierce about 60 mm of armor and is best placed over the engine or the driver's seat. The crew will be badly wounded by small fragments of the inner walls spattering off. The concussion is unbearable. To

destroy the tracks, the charge must fully be covered by them.

Even greater effect will be obtained by combining several 3-kilogram charges.

40. The throwing radius for a concentrated charge is 10 to 15 yards. When throwing it, the soldier must consider the length of the fuze (about 1/2 inch burns in 1 second). The thrower aims at the tracks or at the belly of an approaching tank.

41. The concentrated charge can also be used as a multiple charge or as a slide-mine as described in paragraph 37 above.

42. If the charge is supposed to be used on top of the tank, it must be secured so it will not fall off. For this purpose, its bottom is painted with warmed tar. If the charge is primed, be careful! A charge thus prepared will adhere to horizontal and even to slightly inclined surfaces. Putty can be used also for this purpose, but it is not reliable on wet surfaces.

Charges may be held on a tank by using an anchor made of strong wire, which is hooked into openings or protuberances of the vehicle (see figure 10).

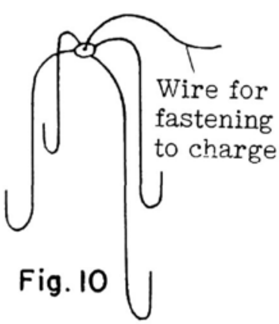


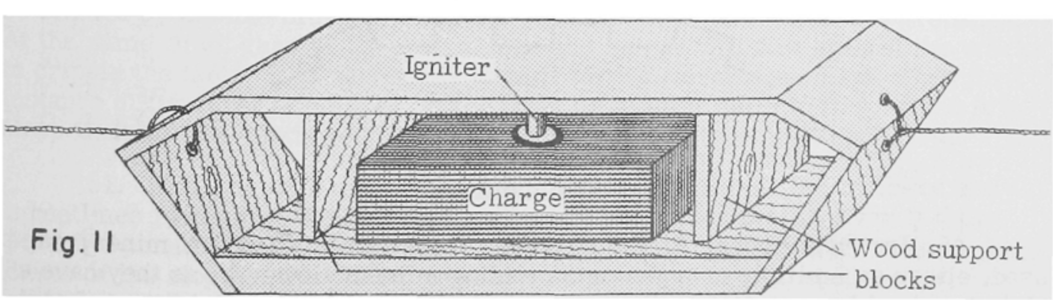
Fig. 10

43. The ignition for paragraphs 39 to 41 is provided by preparing short fuzes with detonating caps (to burn in 4 1/2 to 15 seconds), time fuzes, prima-cord, an improvised pull igniter, or a pressure-igniter. The latter is best suited for the destruction of tracks.

If the charge is thrown, a short fuze is needed (but at least 4 1/2 centimeters* long, like a hand-grenade fuze). If it is placed on the tank, a 15-cm fuze is used for the security of the man placing it.

Sliding Mines

44. Charges of 3 or 6 kilograms can be made and built into a two-sided skid. This sliding mine has to be secured against premature detonation, resulting from falling or turning over, by the insertion of two woodblocks (figure 11).



[*As stated above 1 centimeter of fuze burns in about 4 seconds.]

Two to four sliding mines are linked together and at each end of a given group is a 20-meter cable or rope.

Tank hunters sit in two foxholes about 20 meters apart. The sliding mines are camouflaged and placed somewhere between the holes so that they can be pulled in either direction. At the approach of a tank, they are pulled under its tracks (figure 12).

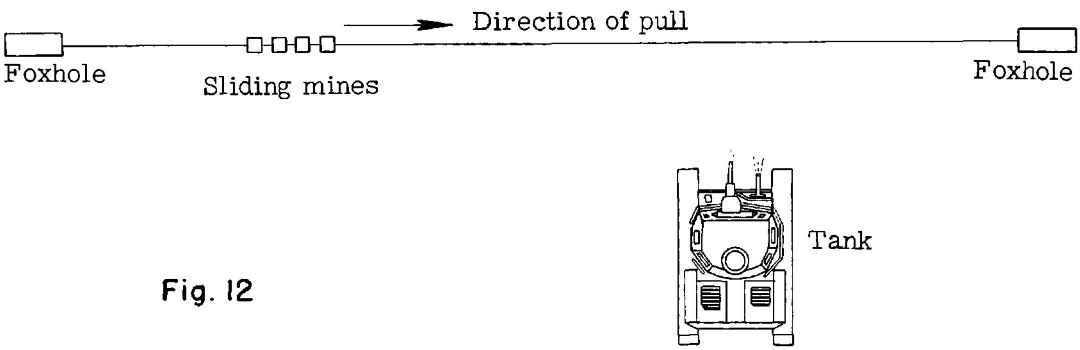


Fig. 12

Several pairs of soldiers in similar foxholes can protect a larger area, for instance a key-point of resistance (figure 13).

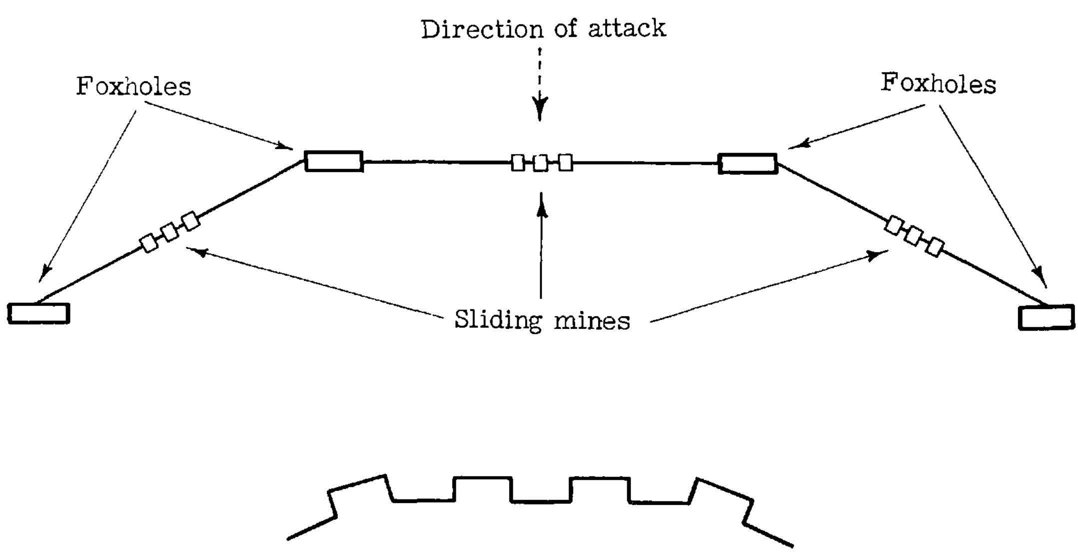


Fig. 13

Tellermines

45. Instead of concentrated charges, Tellermines [antitank mines] can be used, either as multiple charges or as sliding mines. However, as they have a high radius of fragmentation, they can only be worked from splinter-proof positions.

IV Close-in Combat with Firearms

46. There should always be close cooperation between the tank-hunting squads and the other combat elements in the area. Discussion between the leader of the tank-destroyer squad and the leader of the other available arms is advisable in order to fix the beginning and end of the fire attack against a tank.

47. New [Russian?] tanks have especially strong armor at some points. But they have many weak spots, against which even the fire of weapons which are not armorpiercing can be successful. It is therefore imperative to hit the tank not only as a whole, but especially at those weak spots.

48. For this purpose, it is necessary that the rifleman, conscious of the power of his weapon and of his superiority over the tank, should keep cool. He must be able to open fire on the tank as late as possible, surprising it at the shortest possible distance. Courageous riflemen with rifle or antitank rifle, making full and skillful use of terrain, should crawl up to the best range.

The shorter the range, the greater the accuracy of the weapon. Also, the armorpiercing capacity of the ammunition will be increased.

When using armorpiercing ammunition, in order to ensure its successful use, it is important to follow closely the instructions found in the ammunition boxes concerning the aiming points and the effective range.

Opening fire as late as possible has the further advantage of keeping the weapon concealed from covering tanks and observers up to the decisive moment.

49. Frequently it will be advisable to concentrate the fire of several similar or different weapons on one tank e.g., rifles, a light machine gun, a heavy machine gun, an antitank gun, and a light infantry cannon. Ambush-like concentration of all weapons to surprise the tank is preferable. The physical and moral effect will be heightened by such concentration. If only a few tanks appear, it is preferable to assault them successively according to the danger presented by individual tanks. In the case of a massed attack, rigid fire control must insure that the most dangerous tanks are attacked simultaneously.

50. When several different weapons are combined against it, the tank will be blinded by the use of heavy machine-gun fire and small explosive grenades. At the same time, guns of 75-mm caliber and larger will fire against the tracks to cripple the tank. It is necessary to wait for a favorable moment, when for instance difficult terrain slows up the tank, or when it halts to fire. Once it is stopped, it will be destroyed by combined fire or by close-in assault.

51. Weapons with armorpiercing ammunition of smaller calibers are sometimes ineffective against tanks with sloping armor plates, even if their power of penetration would be great enough to pierce the plate if vertical. Because of the slope of the plates, the ammunition ricochets from the tank. On such tanks it is necessary to aim at the vertical parts.

Even in the case of vertical armor plates there will be an oblique angle of impact if a tank approaches at a sharp angle. In that case the angle of impact is also such that the projectiles will ricochet. Therefore, the tank should be fired upon at right angles. If the tank appears at an unfavorable angle, firing will be withheld until it assumes a more vulnerable position, either by revolving the turret or by actually turning and maneuvering.

52. It is possible to increase the effect and accuracy of fire by the selection of a flanking position, because the tanks are usually less strongly armed on the sides, and also offer a bigger target. Furthermore, vertical armor is more common on the sides than on the front.

53. Weak parts of tanks, against which fire from all arms is effective, are: vision slits, openings for hand weapons, periscopes, hatches, shutters, turret rings, ventilator openings, track, belly (the part of the hull between the tracks), and the engine cover (usually in the rear). The accurate location of these parts in the individual types can be found in the manuals.

54. Severe physical and moral effect can be achieved with the rifle, the light machine gun, and the heavy machine gun by firing heavy ball ammunition and armorpiercing ammunition at less than 300 yards against the weak parts of the tank, or by firing with submachine guns and armorpiercing grenades from a grenade discharger at very close range.

Projectiles hitting the vision slits or periscopes blind the crew, and prevent them from aiming or driving accurately. Also, small particles of molten lead and lead fumes penetrate into the interior of the tank and may injure the crew. Some bullets might jam the turret ring or weapon shutters so that revolving of the turret or firing the weapons will be made impossible.

As tanks are more poorly armored on top, attack from high points such as trees or houses will get better results.

The demoralizing effect on the crew of the noise of bullets hitting the tank surface should not be underestimated.

55. HE and armorpiercing grenades (impact fuzes) fired with the rifle grenade-launcher (flat trajectory), antitank guns up to a caliber of 50-mm, the 75-mm infantry howitzer, and the 150-mm infantry howitzer directed against the weak parts of a tank will have about the same results as described in the preceding paragraph. Furthermore the power of impact will cause the inside surface of the armor plates to splinter off and wound the crew. If the projectiles have high explosive charges like the heavy infantry howitzer, the crew will become casualties from the concussion, or they will be at least temporarily knocked out.

When firing against the engine cover in the rear with explosive shells of all weapons, an incendiary effect may be obtained under favorable circumstances. Light and heavy infantry howitzers attack the tracks most effectively.

The ranges for individual weapons have to be selected so that great accuracy of aim can be achieved. For small dispersion and flat trajectory the light and heavy infantry howitzers should use the maximum charge.

The turret, the side, and the rear of the tank are considered weak parts for armorpiercing ammunition. Armorpiercing weapons, unable to use armorpiercing ammunition, can effectively assist in the assault against tanks with high-explosive ammunition.

57. Destructive results in combat against armor are obtained with the 37-mm stick grenade or bomb. Its short range, however, results in success only at close distances.

V Training

58. Training in close-in attack on tanks includes the knowledge of the weak parts, of the construction, use, and effect of close-in weapons, and of combat principles. To this purpose, instruction (using sand-table models and captured enemy tanks) and practical exercises are necessary. After the individual fighter has been trained, the cooperation of the squad and group in terrain exercises will be practiced. Combat exercises with live ammunition against large dummies or captured tanks will complete the training.

59. To improve accuracy in antitank fire, riflemen and gunners of all the arms (machine gun, antitank, infantry howitzer, field artillery) must know all vulnerable parts against which their weapons can be used effectively, and they must perform daily aiming exercises against tank models. Special practice is needed for the use of the Very pistol and rifle grenade. By the use of sub-caliber fire with antitank guns and practice firing with rifles and machine guns against tank models, and by combat exercises, marksmanship is to be developed to the utmost.

60. Each rifleman, whether he is part of a tank-hunting squad or the gunner of an individual weapon, must be thoroughly convinced that, if he fights skillfully he and his weapon are superior to any tank. He has to know that he is the hunter and the tank the game. This thought is to be given great weight in the training period.

VI Assault Badge

61. The destruction of tanks in close-in combat counts as an assault. Rifemen, tank hunters, and other personnel who have fulfilled the necessary requirements in destroying tanks, will be awarded the assault badge.

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TACTICAL AND TECHNICAL TRENDS

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by

MILITARY INTELLIGENCE SERVICE,

WAR DEPARTMENT

[redacted]

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CONTENTS

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SECTION I

1. GAF AIRCRAFT MARKINGS

Before the present war, most nations had distinctive markings on their aircraft, usually some combination of their respective national colors or flag designs. In addition, there were also letters or numerals, or both, designating the type of airplane and the class or unit to which it belonged. After the opening of hostilities, these same markings were generally continued by the belligerent powers, although there were some modifications, especially where there was any possibility of erroneous identification.

The GAF has adopted what appears to be a fairly comprehensive system of markings. The national markings on all types of planes are either a black and white cross or a swastika, or both. The cross ordinarily appears on both sides of the wings and the fuselage, and the swastika on both sides of the fin or rudder.

Identification marks for all operational airplanes, except single-engine fighters, and for many of the transport units consist of a combination of three letters and an Arabic numeral, appearing on the sides of the wings and fuselage, in conjunction with the German cross. The cross divides the four symbols, a letter and numeral preceding the cross and two letters following. The numeral may be in either first or second place, but it, together with the accompanying letter, represents the plane's Geschwader* or, if there is no Geschwader organization, the Gruppe.* The next letter, which immediately follows the cross, is the individual aircraft letter representing the airplane's place within the Staffel.* This letter may be entirely colored or merely outlined in one of a number of colors, or it may be blacked out or shown alone. It is also found painted on top of the wings, or, together with the last letter, is repeated in miniature on the tail. The third and last letter shows the actual Staffel to which the airplane belongs and likewise the Gruppe, since the Staffeln are numbered in consecutive order throughout the entire Geschwader. The following are the third letter designations:

"A" = the Geschwader Stab**
"BCDEF" = 1st, 2d, 3d, 4th, and 5th Gruppe Stabe respectively
"HKL" = 1st, 2d, 3d Staffeln, respectively, of the 1st Gruppe
"MNP" = 1st, 2d, 3d Staffeln, respectively, of the 2d Gruppe
"RST" = 1st, 2d, 3d Staffeln, respectively, of the 3d Gruppe
"UVW" = 1st, 2d, 3d Staffeln, respectively, of the 4th Gruppe
"XYZ" = 1st, 2d, 3d Staffeln, respectively, of the 5th Gruppe

In training and in some transport units, two letters precede the cross instead of a numeral and a letter.

Single-engine fighter units use chevrons to indicate the rank of the pilot, and bars to indicate the Gruppe to which he belongs. The following have been

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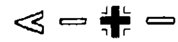
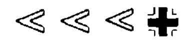
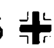
*A Geschwader usually consists of 3 Gruppen, and a Gruppe of 3 Staffeln. Generally there are about 9 to 12 planes in a Staffel.

**Staff or headquarters.

noted on several occasions and appear to be fairly general practice:

Geschwaderkommodore		
Gruppekommandeur		
Adjutant		
Stabsmaschine*		
Staffelkapitan	(Rarely has distinctive markings, but generally flies the lead plane.)	
1st Gruppe	No bar, e.g.,	5 
2d Gruppe	One horizontal bar, e.g.,	5 
3d Gruppe	One vertical bar, e.g.,	5 

The numeral in these Gruppe designations is believed to represent the Geschwader to which the Gruppe belongs. The above markings of the three Staffeln of the Gruppe are colored, respectively, white, red and yellow. A Stabsmaschine is sometimes indicated by a horizontal black line running entirely around the fuselage.

Individual pilots and those belonging to an established unit have followed the practice of having crests. This practice was started by prominent flyers and units of World War I, such as Richthofen, Fonck, and Rickenbacker. Pure heraldry is represented by the arms of the city or cities with which the pilot or units are associated. Other individual devices are geometrical forms, with triangles and diamonds predominating; birds, of which the eagle, owl, and raven are most frequently seen; and animals among which cats, foxes, and horses lead the field. Even "Bonzo" and "Mickey Mouse" have been noted.

Some crests are obviously directed at a particular target. Examples of this type are the cliffs of Dover, an axe cleaving John Bull's top hat, and a dog performing on a puddle-shaped map of England.

Numerous other samples have been observed. One is a shield, with an upper field of three white geese flying against a light blue sky, and a lower field of dark blue sea with white waves. Another portrays a white unicorn rampant, mounted on a green shield, with a red background outlined in white. A third is a shield, quartered red and yellow, bearing a white eagle outlined in black, with a telescope in its claws. A picturesque design is that of a white falcon on a blue background, struck by one red shaft of lightning.

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*Staff or headquarters airplane.

2. GERMAN AIR SUPPORT OF TANKS IN AFRICA

GAF air commands normally detail air liaison officers (Fliegerverbindungsoffiziere, or "Flivos") to the headquarters of Army divisions and higher units, to ensure that army requests for air support and air reconnaissance are properly transmitted to the air headquarters concerned.

However, the experience in the Libyan campaigns indicated that properly coordinated air support of armored units required the assignment of a GAF officer to armored combat echelons below division headquarters. Such an officer must be an experienced pilot, capable of rapidly estimating the weight of air attack necessary to support a particular field operation, and capable of directing the concentration of this attack on any given target at the moment which the tank commander determines to be most advantageous.

In this way, air strength can be utilized to its maximum effectiveness, avoiding the dispatch of large formations to deal with small targets or of insufficient numbers to cover large and scattered objectives. During an attack against a moving target, a liaison officer with flying experience can best direct the aircraft. He controls them by radio from a vantage point where he can watch, and if necessary, follow up the target.

In Tunisia, up to December, 1942, the GAF liaison officer had not operated directly with the armored combat echelons, but had been depending on information supplied by the commanders of subordinate armored units. Since this information frequently proved unreliable for purposes of effective air support, the air command decided to appoint one of their own officers for direct liaison with the combat echelons. This officer rides in a liaison tank, which operates in the second wave of tanks, near the tank of the armored unit commander.

Assuming, for example, that an attacking tank regiment of an armored division is held up by enemy resistance and immediate air support is needed, the procedure would be as follows. The regimental commander consults with the air liaison officer, and a decision is made as to the air support required. The request for air support is then transmitted by radio to the headquarters of the Fliegerführer (officer in charge of air operations in the area); this message is simultaneously received at the headquarters of the armored division. The message should include the position and type of target to be attacked, the estimated number of aircraft required, the type and height of cloud cover, and the possible opposition to be encountered.

The Fliegerführer then orders, from the airdrome nearest the scene of action, such air support as he thinks necessary, and notifies the liaison officer when the formation is about to take off. Direct communication between the liaison officer and the aircraft is established after the formation is airborne. The liaison officer directs the planes to the target by radio. If, meanwhile, the target has changed position, he indicates its new location. Radio contact is also maintained between the liaison officer, the commander of the tank regiment, and the other tanks.

Comment: The above information seems to bear out reports from other sources concerning German practice in recent operations, and as such, is considered to be worthy of credence.

ANTITANK

3. THE GERMAN "AP 40" ANTITANK SHOT

This is a special type of AP ammunition used with most German tank and antitank guns in addition to the conventional AP projectile. It consists of a mild-steel body, a light-alloy or plastic ballistic cap, and a cemented, tungsten-carbide core. The weight is only about 50 to 65 percent of that of normal AP shell. The muzzle velocity is high, but the velocity falls off rapidly with the increasing range so that increased penetration is obtained at short ranges only.

ARMORED FORCE

4. SUGGESTED REORGANIZATION OF THE RIFLE COMPANY OF A GERMAN ARMORED RECONNAISSANCE BATTALION

The following is an extract from a document prepared by a rifle company of a German armored reconnaissance battalion. While the reconnaissance battalion is no longer included in the German armored division, its functions having been taken over by a division motorcycle battalion, this document is felt to be of interest in that it shows how the principle of decentralization, visible throughout the entire German army, is given emphasis. Furthermore, German tactical groupings organized along lines essentially similar to both the units discussed below may well be encountered. The document has reference to operations in North Africa against the British during the early summer of 1942. The extract therefrom follows:

* * *

a. Present Organization, Equipment, and Functions

(1) Organization and Equipment

The organization and equipment of the company consists of:

Three light platoons, each with seven armored half-track personnel carriers, and one 37-mm antitank gun on an armored half-track.

One heavy platoon with nine armored half-track personnel carriers, and two armored half-tracks with heavy mortars.

In all there are 37 half-tracks, of which 32 are armed with machine guns.

(2) Missions and Operations

The company, as such, was fought as a unit. It performed combat tasks and security missions. Reconnaissance missions were not assigned the company. However, individual platoons, reinforced with armored cars, antitank guns, and a captured 25-pounder (British 3.45-in field artillery piece), were used for reconnaissance in force.

The following types of operations were performed by the company:

Attack against hostile forward positions and counterreconnaissance screens;

Breaking through hostile motorized elements to eliminate flank threat;

Attack on enemy positions;

Blocking hostile attempts at penetration;

Defense against attacks by enemy armored vehicles;

Counterattacks.

b. Suggested Reorganization

(1) Changes in Organization

It is suggested that the number of half-tracks in the three light platoons and the heavy platoon remain the same, but that the weapons be as follows:

Light platoons--each to have two (instead of one) 37-mm antitank guns on half-tracks;

Heavy platoon--four half-tracks with 75-mm guns, two with heavy mortars, and four with 28/20*-mm, or French 25-mm,** antitank guns.

(2) Advantages to be Gained

The offensive power of the company would be considerably increased by the incorporation of the additional weapons. Machine guns and 37-mm antitank guns remain indispensable for ranges below 2,000 yards. With the 75-mm gun, fire superiority can be quickly obtained at longer ranges, especially in attacks on

*Choked bore--tapering from 28 mm to 20 mm.
**This is a dual-purpose AA/AT gun.

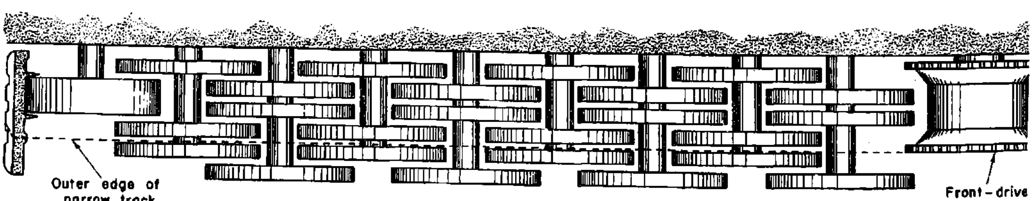
the move; at short ranges they constitute a superior weapon against enemy positions, dug-in antitank guns, etc. The antitank section with four guns should supplement the 37-mm antitank guns, which are not effective against armored targets at long ranges.

The existing heavy platoon organization with its two heavy mortars and six machine guns is not sufficient for the tasks of the platoon in Africa. Even support from the artillery battery, which is usually available, is not sufficient. As the platoon which must support the company attack, provide the main weight of fire and establish fire superiority, the heavy platoon must be more generously equipped with heavy weapons. For the most part, it is this platoon which has to deal with enemy self-propelled guns, armored cars, tanks, and dug-in antitank guns. The 75-mm gun, the mounting of which on half-track personnel carriers has been successfully tried out, is the weapon needed. Against enemy tanks the company requires a reliable antitank weapon. The 28/20-mm antitank gun or the French 25-mm gun mounted on a half-track is suitable. The above reorganization of the heavy platoon is required in the African Theater. On its own initiative the company has already created a heavy platoon with two 75-mm infantry guns and four 25-mm antitank guns mounted on personnel carriers.

5. GERMAN HEAVY TANK--PzKw 6

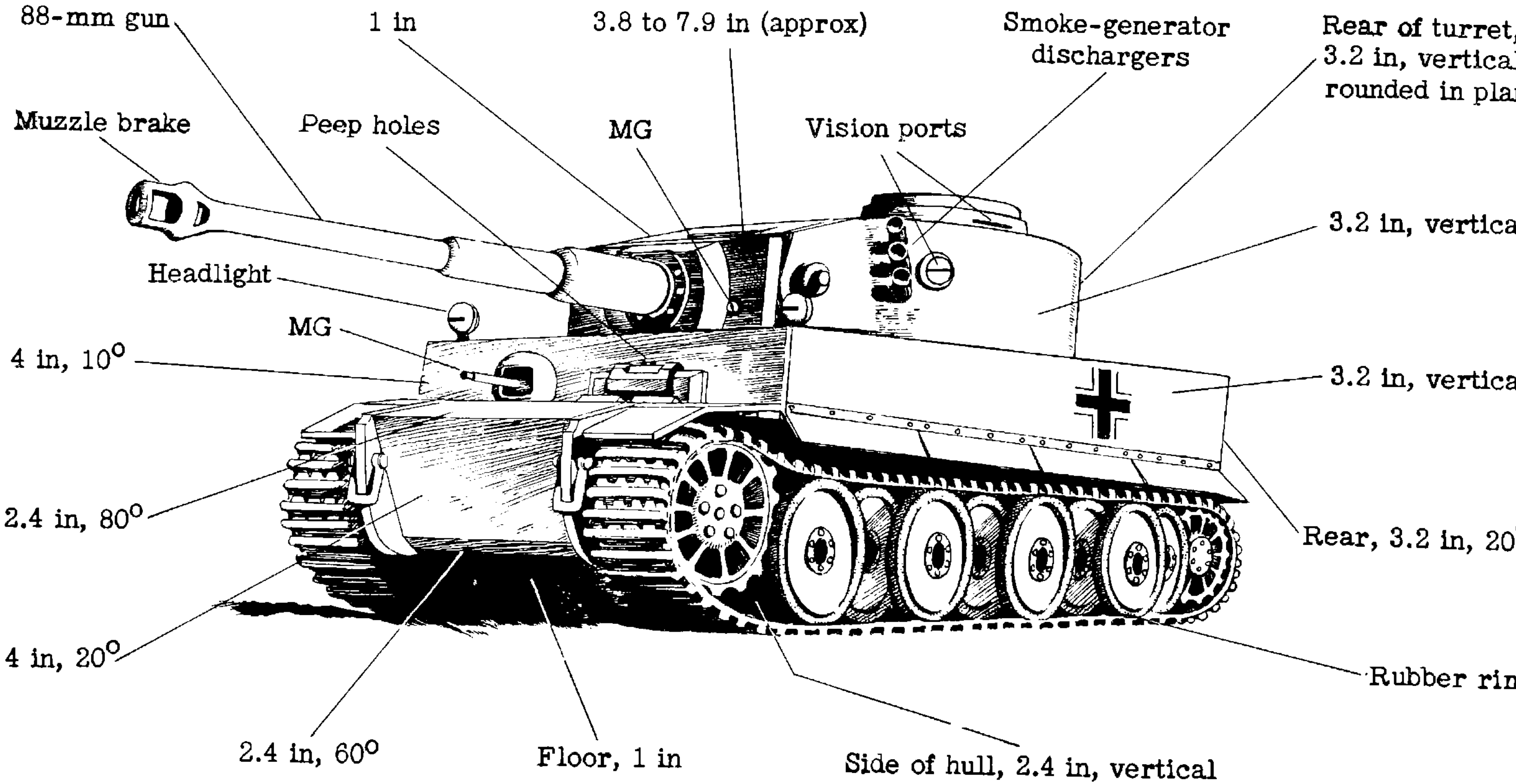
This tank has already been described in Tactical and Technical Trends (No. 20, p. 7). The accompanying sketch of the tank is based on photographs of a PzKw 6 knocked out on the Tunisian front.

The suspension system, which has only very briefly been described in Tactical and Technical Trends, is shown in the sketch below. The track is made of metal. To the far right in the sketch is the front-drive sprocket and to the far left, the rear idler. There are no return rollers since the track rides on top of the Christie-type wheels, which are rubber rimmed. It will be noted that there are eight axles, each with three wheels to a side, or each with one single and one



SUSPENSION SYSTEM OF PzKw 6

double wheel to a side. There are thus 24 wheels, or 8 single wheels and 8 double wheels, on each side of the tank. The system of overlapping is similar to the suspension system used on German half-tracks.



HEAVY TANK — — PzKw 6

The tank is provided with two tracks, a wide one (2 ft, 4.5 in) and a narrow one (just under 2 ft). The wide track is the one used in battle, the narrow being for administrative marches and where maneuverability and economy of operation take precedence over ground pressure. The dotted line in the sketch of the suspension system indicates the outer edge of the narrow track. When the narrow track is used, the eight wheels outside the dotted line can be removed.

CHEMICAL WARFARE

6. GERMAN CHEMICAL WARFARE NOTES

a. Lung-Destroying-Smoke and Projector--Do Gerät

From an unofficial German source, it is reported that a six-barreled smoke projector has been developed using liquid air as a propellant. (See Tactical and Technical Trends, No. 10, p. 23 and No. 17, p. 39 for information on a German six-barreled rocket projector.) The smoke was described as "lung destroying" and "uncanny," and as used only under Hitler's orders.

b. Mist Screen

It is reported that a type of misty smoke screen can be put up in 2 minutes from a friction-top jar. When the top is torn off "you hear a hissing and the mist appears." Inside the screen, people can see each other perfectly, but from the outside, the fog has the appearance of a natural ground mist.

7. GERMAN AREA SMOKE-SCREENING*

Numerous reports indicate that the Germans have found the use of smoke screens at night to have considerable protective value against enemy bombing attack. This has been particularly true of the coastal areas, where unscreened coastlines offer a ready means of calculating distances accurately. In inland areas, where targets are not so easily located, smoke screens are generally limited to the protection of precision targets of prime importance. However, there are indications that several of the larger inland cities are protected in this way. In addition, decoy smoke screens have been effectively employed upon a number of occasions to protect nearby targets.

Relatively few instances of daylight screening have been reported to date, and on the whole the practice has not proved particularly effective. With the increasing frequency of daylight raids over the Continent, it is to be expected that the Germans will take steps to protect vital target areas with efficient smoke screens both day and night.

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*Prepared in the Office of the Chief, Chemical Warfare Service.

The Germans have used smoke extensively for screening:

(1) Battleships, docks, and naval installations;

(2) Oil refineries and storage;

(3) Important blast furnaces, factories, and buildings;

(4) Canals and harbors.

The most exact knowledge of large-scale smoke operations comes from Brest, where several large German battleships and cruisers were successfully protected from enemy bombing over a very considerable period of time. A screen was put up immediately upon the sounding of an air raid warning, and within 20 minutes the docks and town were completely enveloped in smoke. It is reported that the screen was so dense that visibility on the ground extended for only a few yards.

The generators appear to have been of the Smoke Generator 41 type, consisting of a 40- to 55-gallon steel drum fitted externally with a stopcock and a steel projection tube. They contain 20 gallons of a chlorsulfonic acid and sulfur trioxide smoke mixture, which is expelled by means of a cylinder of compressed air contained within the generator drum. Alongside the generator, a similar drum of smoke acid was provided for recharging. By this means a smoke screen could be maintained at full strength for 2 hours. The smoke is described as issuing from the generator in the form of a liquid, which immediately vaporizes. It has the color of tobacco smoke and is said to be almost odorless and harmless, but irritating to the throat.

More recent reports indicate replacement of the original equipment with an apparatus similar to the German naval chlorsulfonic acid smoke generator. This consists of two containers, one containing the chlorsulfonic acid and sulfur trioxide mixture, and the other compressed air for atomizing the smoke acid. Obviously, the newer type of equipment provides an uninterrupted generation of smoke over a considerably longer period of time. It is definitely reported that, on at least one occasion, the smoke screen was effective throughout an air raid lasting 4 hours.

The generators were scattered around Brest and its suburbs and along the docks and breakwaters, either in groups of several or at intervals of roughly 75 yards. Additional smoke was provided by about 20 small fishing craft (10 to 12 tons), each provided with a smoke generator. These boats were moored during the day at the end of a jetty, and at dusk were anchored in crescent formation in the harbor 1 or 2 kilometers from shore.

While practically all reports describe the smoke acid as composed of a mixture of chlorsulfonic acid and sulfur trioxide, one report mentions the use of a "weak mixture of titanium tetrachloride and ammonia." It is believed that the Germans have overcome the clogging difficulties formerly experienced with

titanium tetrachloride when used in spray generators, and it is known that ammonia increases the density of the smoke.

Aerial photographs showing smoke screens in Norwegian fjords are evidence of the increasing effectiveness of this method of protecting primary targets. There is reason to believe, however, that development has not reached the point where desired results can be obtained irrespective of wind direction. While German warships shown in these photographs were not completely obscured by smoke, the protection afforded appears to have been considerable and would hamper raiding aircraft to a marked degree.

Reports concerning the materials and equipment employed in screening Norwegian coastal areas are less specific. According to a prisoner of war from one Norwegian port, smoke-producing liquid is stored in 40- to 55-gallon drums in the holds of fishing vessels. When poured into the water, the liquid takes the paint off the sides of the boats and causes the putty around their portholes to flake and drop off. A heavy grayish smoke develops, which clings to the water and spreads gradually upward as the concentration increases. On one occasion, a half hour elapsed before complete protection was afforded. This source reports, however, that smoke became effective over a limited dock area in a specific German port in only 5 minutes.

Another unverified report states that the main part of a smoke screen employed in a certain area in Norway was produced by 20 small fishing boats, each manned by 3 or 4 men, whose operations were supplemented by 3 land-based crews. The smoke here was more irritating to the nose and throat than the harmless, odorless smoke produced at Brest. It is said to have incapacitated men working in the vicinity, although cattle in adjoining fields apparently were not seriously affected. According to a Norwegian source, the Germans appeared reluctant to start smoke screens except when a major attack was imminent. The reason for this was not known, although it is suggested that the cost of the operations may be a factor.

It seems quite likely that smoke screen operations in German-controlled coastal areas are aided by minesweepers (R boats), which are reported to be fitted with smoke generators using chlorsulfonic acid and/or oleum. Also, German E boats doubtless contribute to these operations. In addition to carrying two of the smaller smoke apparatus (Smoke Generator '41') aft, one on each side, they are equipped with French smoke floats. The latter apparatus, weighing 40 kilograms (88 lbs.) when filled, contains 32 kilograms (70.4 lbs.) Berger-type* smoke mixture, which burns for periods variously estimated from 8 to 14 minutes.

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*Berger Mixture, named after the French chemist, consists of the following:

Zinc (dust)	25 to 30 percent
Carbon tetrachloride	45 to 55 percent
Zinc oxide	10 to 20 percent
Kieselguhr	5 to 10 percent

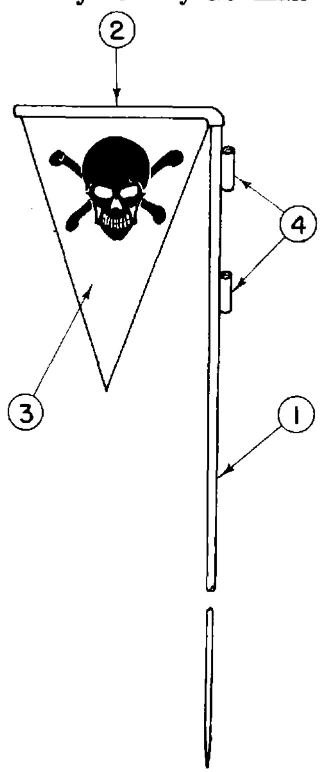
Certain German cities are reported to be protected by extensive smoke-screen systems. RAF pilots have reported dark-gray smoke screens over Berlin, 20 to 30 miles long and 2 miles wide. The very dense smoke appeared to have come from generators 20 yards apart. (Note: 75-yard intervals appear to be the more normal spacing.)

It is reported from Kiel that a screen of gray-brown smoke covering the entire city is produced from the exhausts of automobiles racing through the streets whenever there is danger of an air raid.

Before the war, the question of pipe-line installations with jets at suitable intervals was discussed in German technical literature. There have been indications of the use of this system to screen certain factories in Germany, such as the Krupp works near Essen. Reports from Greece indicate that a pipe line for smoke screens runs the entire length (4 miles) of the Corinth canal.

8. GERMAN WARNING FLAGS FOR GASSED AREAS

If gas warfare is initiated in the present war, infantry occupying ground formerly held by German troops may meet with the signal flags illustrated in the accompanying sketch. They are warnings against areas contaminated with gas.



(a) Description

The set consists of 20 flags, 1 roll of marking tape, and a satchel in which the flags and tape are carried.

The warning flags are attached to 2-foot long, light iron rods (1) 3-mm (0.12 in) in diameter, painted red. The lower end is pointed and the upper 4 inches bent over at a right angle so as to form a pointer (2). Hanging from this is a triangular yellow cloth flag, (3) which has the skull-and-cross-bones device printed in black. At the top end of the upright portion, the rod has an extension device consisting of two metal eyes (4), enabling the flags to be mounted one on top of the other.

The marking tape for outlining contaminated ground is a light and water-fast dyed ribbon 0.8 inch wide. Two rolls each of 27 yards are wound on a papier-mache' bobbin to form a roll.

The 3-pound carrying satchel is made of canvas, and the bottom is reinforced to prevent perforation by the rods. It has a side-pocket to carry the marking tape and is provided with an adjustable sling.

(b) Method of Use

When a gas scout confirms that the ground is contaminated, he places his flag in uncontaminated ground about 5 yards from the edge of the contamination, and with the pointer toward the area contaminated.

The interval at which flags should be set depends on whether the country is open or close. As a rule the interval should be about 20 to 50 yards. On ground which is covered with high vegetation, the extension device should be used and one flag placed above another.

When the forward limits of the contamination have been determined and marked with warning flags, the limits are made more obvious by means of branches, stones, etc., or by festooning trees and bushes with marking tape. This is particularly necessary in covered country, with scrub and brush, where there is a danger that warning flags cannot be seen.

If the contamination is likely to persist for some considerable time, the warning flags and marking tape will be replaced by warning boards and by wire barriers festooned with yellow streamers.

ENGINEERS

9. GERMAN FIELD EXPLODER, 1941 MODEL

The existence of a German "Siemens" exploder, 1941 model, has been reported in the Middle East. It is smaller, lighter, and more compact than the 1937 model. There is no indicator window to show if the main spring is fully wound, but the exploder cannot be fired until the winding is complete. In the carrying case is a neon tube which can be placed across the exploder terminal. On firing, the tube will light up if the exploder is working properly.

10. SOME BOOBY TRAP PRECAUTIONS

a. General

British observations indicate that certain elementary precautions outlined below will save lives and avoid injuries caused by hidden mines and booby traps. All troops likely to come into contact with mines and traps should understand these measures. They fall under three heads: movement, search, and neutralization of ignition devices.

b. Movement

Whenever it is suspected that mines or traps are about, movement should

be restricted, and a careful search made for disturbed surfaces of the ground, and for loose boards.

c. Search

Where the presence of loose earth indicates that a mine has been laid, the earth should be carefully removed by hand without exerting any pressure on the mine. Loose boards should always be suspected of concealing a mine. When the device that sets off the mine has been uncovered, the procedure is to neutralize the mine in accordance with the instructions given for the particular type. If neutralization cannot be carried out immediately, the location of the mine should be clearly marked. In most cases mines can be rendered safe and removed, to be used later against the enemy. When the removal is undesirable, the mines will be detonated on the spot by specially trained personnel.

d. Neutralization

When wires or cords are observed, a safe rule to follow is that taut wires should NOT be cut, and slack wires should NOT be pulled. Trace each wire to its source. One end may be attached to a post, peg, or tree stump; the other end will be attached to the mine. Only after neutralizing the firing device should the wires be cut, and then preferably with scissors or cutters so as not to increase the tension in the wire.

In buildings nothing should be removed until a thorough examination has been made. Traps may be operated by the opening of a door or window, or by the movement of loose boards, and the trap may be at some distance from the bait.

e. Actual Examples

From the Middle East come the following examples of actual booby traps:

(1) Approximately one Tellermine (German antitank mine) in five is fitted with an antilifting device.

(2) Mines were found lying on the surface, unarmed, with the safety-pin in place and the arming wire still wrapped around the igniter, BUT with an antilifting device underneath.

(3) One mine on top of another, connected by a pull-igniter.

(4) Five barrels filled with earth and placed across the road. One or two had mines with pull-igniters pegged to the road, which exploded when the barrels were moved.

(5) Some barrels placed on top of a culvert contained a heavy explosive charge which blew in the culvert when the barrels were moved.

(6) A truck abandoned partially across the road, with one rather obvious wire to a land mine, and another, carefully concealed, attached to the pull-igniter of a carefully hidden second mine.

(7) Mines with pull-igniters were found under debris.

11. GERMAN MINE-LOCATING INSTRUMENTS

Information has become available regarding the "Frankfort" mine-detector in use by the German Army. This is an electrical device and is suitable for locating metallic land mines. It consists essentially of three parts: the batteries and electric oscillator circuit which are mounted in a pack on the back of the user; the searching stick with antennae which is carried in the hand; and a pair of head-phones which are connected to the oscillator circuit in the pack.

The user first assembles the apparatus and then, while holding the antennae away from the vicinity of any metallic object, adjusts the tuning dial of the instrument until a uniform low-pitched buzz is heard over the head-phones. The operatc then moves forward slowly, swinging the searching stick in a half-circle in front of him with the antennae held about 1 or 2 inches above the ground. The electrical balance of the antennae and oscillator circuits will be upset when the antennae are brought into the proximity of any metallic object. This unbalance results in changing the tone of the note heard in the head-phones from the original low-pitched tone to a high, shrill sound. The closer the antennae are moved to the metal object, the higher the note becomes; this enables the user to locate the exact spot at which the mine or other metallic object is buried.

One weakness of this device is that it is impossible to distinguish between metallic mines and odd bits of metal, such as tin can, shell splinters, and the like. Another weakness is that it can be defeated by using wooden cases for mines instead of metal cases, in which event the detector fails to give any warning of the proximity of the mine. The device is sensitive to the average metallic land mine up to a distance of about 3 feet.

In order to overcome the last objection given above, the Germans still use a bayonet or a form of metallic probe to locate the mines by probing in the area under search.

From another source tnan that responsible for the above information, it is reported that in recent experiments with mine detectors, and improvised mines under about 4 inches in depth, the older model Aachen gave consistently better results than the new Frankfort detector.

GENERAL

12. NOTES ON GERMAN DIVISIONAL INTELLIGENCE

The system used by the Germans in training those selected for intelligence work at one particular Division headquarters, as well as the organization and scope of the work of this branch of the service, is described in the following report based on German sources.

The 10 weeks' course of training in the instance cited was given at what is known as the Interpreters' Training Depot. This was organized on military lines, and trainees generally held the rank of corporal.

The Depot did not give courses which lasted a specific time. Trainees remained there until they had passed the necessary tests and were then assigned. Three grades of proficiency were established; 3d class or Sprachkundig (conversant with the language), 2d class or Sprachmittler (translator), and 1st class or Dolmetscher (interpreter).

Training consisted chiefly of language study, especially translation of documents. Lectures were given on British army organization, but trainees were not expected to have a comprehensive knowledge of the subject, and no handbooks or pamphlets were used. It does not appear, for example, that British tank recognition was included in the studies.

The Intelligence Section at this Division (light) headquarters consisted of one officer, one interpreter, a corporal, and a clerk. It was housed in tents and had no motor transport. It did not issue an Intelligence Summary, but received the army intelligence summary (Feindlagebericht). Intelligence information was passed on to Division and unit commanders at the commanders' conference. The Division intelligence officer did not visit forward troops or battalion headquarters.

Intercepts were not seen by the Divisional Intelligence Staff, but information from this source was included in army intelligence summaries. An enemy order-of-battle map was kept, but no card-index system was used. The German handbook on the British Army (Taschenbuch des Engl. Heeres) was used for reference. No liaison was maintained with adjacent Italian units.

The work of one man consisted in the preliminary interrogation and identification of prisoners. He was employed as liaison officer between the intelligence branch of Panzer Army and Division Intelligence section when necessary. In quiet periods, he was responsible for the welfare and comfort of Divisional troops.

PWs were brought directly to Division headquarters and were interrogated in one of the tents belonging to the Intelligence section. The interrogator did not use the printed form for interrogation of PWs, but listed their personalia (effects). No selection of PWs was made, and documents were forwarded without the name of the PW from whom they were taken. Army Intelligence was then informed by telephone, and occasionally asked for PWs to be sent up to army headquarters.

Normally, PWs were sent to a designated cage; officer PWs were interrogated and sent to the cage in the same way. The interrogator in the report in question never went forward to interrogate, (e.g. to the brigade headquarters when a patrol was sent out) and never worked at the cage.

PWs taken by Italian units remained in Italian hands and were not interrogated by the Germans.

Great importance was attached to captured documents. These were studied by Divisional Intelligence and then forwarded to the army.

INFANTRY

13. ITALIAN ROCK-CLIMBING PLATOONS

In mountainous country, difficult rock barriers occasionally present serious obstacles for infantry to overcome. To scale them, and thus open trails for the other troops to follow or to push through surprise attacks, has been effective in many campaigns.

The Italian rock climbers, although not necessarily mountain men, are usually volunteers, picked for their strength and hardihood. They are organized into platoons and trained by the Alpine regiments. Special equipment is carried: wind breakers, felt-soled leather shoes, ropes, screwrings, and hammers. They are armed with rifles, and presumably with light machine guns. The one month's course provides progressively more difficult courses of instruction in actual climbing, until they are able to scale vertical rock faces.

14. SOME JAPANESE DEFENSIVE METHODS

In previous issues of Tactical and Technical Trends, references have been made to some defensive tactics used by the Japanese. The following notes from British sources give added emphasis to this subject and are reported here in order to facilitate recognition of these tactics.

a. General

Japanese tactical methods in the defense conform basically to normal practice, but they are characterized by a very high standard of camouflage. Except in marshy country, where the Japanese build up to as much as 8 feet above ground level, it is difficult to spot their positions, which are skillfully hidden under bushes, hedges, and buildings and even under the roots of big trees.

Whether in jungle or other country, the principle of all-around defense is strictly applied, and positions have so far presented no weak spots. Defended

areas, however small, are self-contained with regard to ammunition and food, and they are stubbornly defended--literally to the last man. Japanese seriously wounded have been found still grasping hand grenades which they have been too weak to throw, and on other occasions repeated offers of quarter in a hopeless situation have been refused.

The information given below is based on experiences in New Guinea and the Solomons, and while principles--such as depth in the defense, all-around defense, and the application of camouflage--do not alter, details such as the employment of supporting weapons and the construction of defenses, will vary considerably according to the nature of the country. This point should be remembered when studying what the Japanese have done in the dense jungle of New Guinea, so as to be prepared for something different in the more open spaces of, say, Central Burma and China.

b. Organization of Defensive Position

The Japanese choose positions on commanding ground and site their defended areas in great depth along the line of communication.

Weapons are sited to cover all approaches and are protected by booby traps. Weapon pits are small and cleverly concealed. They normally contain one or two men and are often linked by tunnels. Whether in swampy or dry ground, overhead cover is often constructed.

Automatic weapons are sited to fire along prepared lines which intersect. These lines are cut in the jungle to a height of about 2 feet, presenting a tunnel effect. 30-caliber heavy MGs are likely to be sited well forward and sub-allotted to platoon localities. Positions containing automatic weapons are frequently protected by snipers in trees near the position. Men in trees have also been reported on the flanks of positions.

In swampy areas, two types of earthworks are constructed. The first, called in the Southwest Pacific the "bunker" type, consists of a trench with closely timbered sides and top. The trench is covered by a mound which is built up with coconut-log piles laid lengthwise and packed with earth. The height of the mound and the depth of the trench vary according to the level of the swamp water. Some mounds rise to about 8 feet above ground level. These mounds have slits at ground level for automatic weapons, and the positions are connected by crawl trenches. The mounds give protection to the defenders against mortar and antipersonnel bombs and limit the effect of 25-pounder (88-mm) shells. Positions are camouflaged with local natural materials.

The second type of earthwork is similar in appearance to the first, but it is constructed without loopholes and used for concealment and protection from artillery and mortar fire. Attacking troops, attracted by these raised earthworks, tend to make them their objectives and are then caught in the fire from posts constructed at ground level on the flanks and in rear of these earthworks.

In addition to the construction of these earthworks, the Japanese pay particular attention to the careful digging of dugouts. In the Solomon Islands, for instance, it was found that hand grenades could be thrown into Japanese dugouts but, owing to the special construction of the entrance, they exploded harmlessly inside without killing the occupants, who were subsequently able to emerge and fire into the rear of our troops. In this area the dugouts were cut back into a hillside and were sited so as to be mutually supporting. They were constructed to hold about eight men each and were faced on the front and flanks with sand bags and steel plates. Their layout was as shown in the diagram (see Tactical and Technical Trends, No. 10, p. 13).

Telephone cables are laid between defended localities, but according to information received so far, visual methods of intercommunication, such as flag or shutter, have not been employed.

c. Conduct of Defense

In jungle country the fire fight takes place at ranges of between 50 and 100 yards. It has been found especially necessary to make a short pause between igniting the fuze of a grenade and throwing it, as otherwise the Japanese are adept at throwing them back.

The Japanese make frequent use of small local counterattacks conducted by 8 or 10 men and led by an officer.

d. Deceptive Tactics; New Guinea

The following notes summarize some of the tactics used by the Japanese in the New Guinea area. The extensive use again made of deceptive tactics should be noted.

(1) When the Japanese met the enemy line of skirmishers they fired all their machine guns into the tree-tops above their opponents. As soon as this fire was countered by Allied machine guns, the Japanese mortars opened up on these machine-gun positions.

(2) On several occasions when the Allied line of skirmishers was met, large numbers of Japanese ran forward and were met by a withering machine-gun fire. They immediately turned round and fled. Allied troops with the usual cry of "After the bastards" rushed forward with fixed bayonets. Immediately, the fleeing Japanese threw themselves on the ground and Allied soldiers ran into machine-gun fire from the Japanese rear.

(3) In the Milne Bay area the Japanese plan was to advance and attack during the night and then to withdraw during the daytime, leaving dozens of their men in the tops of coconut palms, and in the jungle, with automatic weapons. As Allied forces advanced the next day, they were harassed by these remnants. Often the Japanese were tied in the tops of the palm trees and remained there after they

were shot.

(4) There were times when it was felt that the Japanese troops might have surrendered, but in no case did they do so. It was a question of keeping at them until every man was killed.

(5) Counter Tactics

The plan eventually developed by Allied forces, as they advanced during the day, was to drop a platoon or two each 4 to 5 hundred yards apart as they advanced, and eventually they would meet the main Japanese forces. By nightfall each of the independent posts and the main force would slash a perimeter clearing of about 200 yards diameter around their posts, rig trip wires at the edge, and then confidently await the Japanese night attack. This appeared to upset the Japanese plan and proved very successful.

15. FURTHER NOTES ON THE MALAYAN CAMPAIGN

To some extent there may be an element of repetition in the report which follows, but even granting that such is the case, this will serve to highlight the lessons derived from actual experience.

"We must know our foes and know them well," writes the American compiler of the following notes, which indicate some of the basic tactics used by the Japanese in the Malayan Campaign.

"On the tactical side the campaign was an excellent example of 'jungle warfare' and of the use of waterways as arteries of communication and movement. Throughout the campaign there was none, or practically none, of the fanatic frontal charges which characterized Jap tactics in North China. In Malaya it was a case of constant infiltration and constant small-scale envelopment.

"Many of the envelopments were over water and involved landing behind the Allied front. In these 'water-land' operations the experience gained along the Yangtze River and elsewhere in China no doubt was of real value, but most of the Malayan landings had a character uniquely their own. In China the landings habitually were made under the guns of the Navy. The same was true of the basic landing at Kota Bahru, where half-a-dozen Jap troop transports stood off-shore while the troops reached the beaches in various types of special landing crafts.

"But most of the tactical landings involved in the envelopments under discussion occurred on the western coast where, of course, there was no Jap naval support. These landings generally were small in size--perhaps a company or two, or at the most a battalion. The Japs made great use of what they found locally in the way of floating craft, and in view of the size of the Malayan fishing fleet what they found was considerable. In addition, there is evidence that a few special land-

ing craft, motorized and with a capacity for as many as 100 men each, were transported overland from Singora for use along the western coast.

"A characteristic of the Japanese landings was the evident use of alternative objectives. There are several instances in which a convoy, encountering resistance at one point on the coast, moved up or down coast to another more favorable point. Thus was the principle of infiltration applied to tactical landings.

"Infiltration or jungle warfare are the words generally applied to the actual fighting off the roads as it occurred throughout Malaya. The basic Jap tactic involved extreme decentralization: giving a small unit or even an individual soldier an objective, and telling it or him to get there. In the process of getting there the Jap practice was constantly to seek to slip through or, if attack was necessary, to make it from a flank. All accounts agree on the reluctance of the Japs to push ahead frontally."

16. NOTES ON GERMAN PARATROOPS--NEW TYPE 105-MM MORTAR

The Africa Korps parachute troops, according to a very recent unofficial source, but one considered quite trustworthy, are armed with the best weapons and they constitute the crack unit of the special troops of the Africa Korps. Considered the bravest in the army, they are used as shock troops only. When possible, they are kept no longer than five months at the front, then sent home for instruction to correct faults noted in the last operation. To acquire full and complete confidence in his equipment, the German paratrooper makes six jumps before he is sent to the front line, and not till then does he receive his insignia. (On the other hand, a pilot of a Ju-87, Ju-88 or Me-109 makes no trail jumps, so that he will not acquire the feeling that the parachute is to be depended on. Therefore, in case a forced landing is necessary, he will do his utmost to reach his own lines.)

Attached to the paratrooper's uniform, called a "bone-sack" (Knochensack) are potato-masher and egg grenades. Cartridges for pistol and rifle are carried in the pockets. Part of the equipment is a curious cleaver-like weapon or implement with a blade of from five to six inches long. How it is used was not reported--perhaps to cut free from tangled shrouds. Air-borne troops are not jumpers. The infantry land in airplanes or gliders where the paratroopers have taken an airfield. The air-borne infantry supports the paratroopers.

Before the jump, the rip-cord is fastened to the jumping apparatus so that the parachute can open itself. This occurs safely 99 out of 100 times. As the men are reported to jump from heights of only from 50 to 75 meters, little chance is left to open a reserve 'chute, if one is worn. The 'chute is supposed to open after a 12-meter fall. Troopers are trained to use enemy weapons. Rations, extra ammunition, machine guns and other weapons are, of course, dropped in containers by parachutes.

A paratroop battalion is organized, in general, as follows:

Battalion staff
Communications platoon
Four parachute companies.

The light weapons which the paratroopers carry during the jump are:

.08 Model automatic pistol, .36 in (9 mm)
.98 Model rifle, .312 in (7.9 mm)
Light machine gun
Potato masher and egg grenades.

The heavy weapons, dropped in containers, are:

Heavy machine gun, 7.9 mm
Heavy mortars, 3.2 in (80 mm)
Light mortars, 1.96 in (50 mm)
New-type mortar, 4 in (105 mm).

On the paratroop motor vehicle is painted the organizations' designations--for example:

R - means, Col. Ramke, (commander)
R.B. - means, under command of Ramke, Maj. Burckhardt* battalion
R. Hv - means Ramke, Capt. von der Heide's battalion.

The "new-type mortar" referred to above has not, as far as known, been previously reported. As yet, no technical description of this weapon is available but the accompanying sketch and description is believed to give a fair, general idea of its characteristics and appearance.

The following numbers and items have reference to the accompanying sketch.

1. Shell (percussion fuze), cal 105 mm
2. Barrel, smooth bore
3. Dust protector, placed in the rear (3 A) when not in use
4. Wood or composition block, placed at base for the breech (holds firing pin)
5. Powder charge
6. Percussion cap--fastened in center of powder ring--and firing pin
7. Steel reinforcement
8. Tripod
9. Barrel--binder lock--the barrel is fastened to this
10. Joint by which the barrel is moved
11. Sight mechanism, optical device with crank

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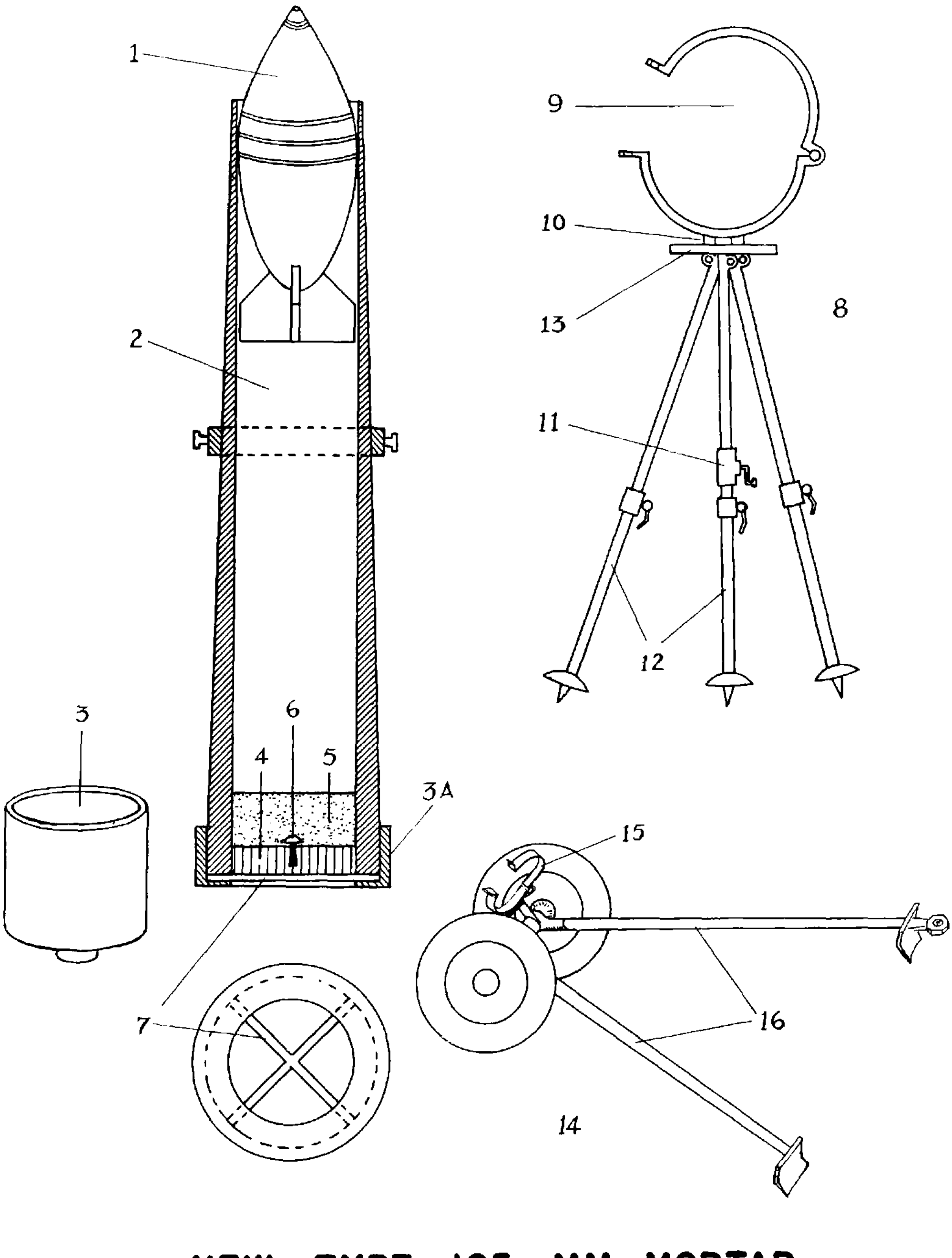
*A well-known paratroop officer, now prisoner in British hands.

12. Adjustable legs
13. Bubble sight
14. Carriage--similar to that of a 37-mm antitank gun, but smaller
15. Barrel fastener
16. Split trail

17. MG TRACER CROSS-FIRE TO INDICATE TARGETS

For the purpose of indicating targets, the Japanese in Burma, according to a very recent British report, use tracer fire from two machine guns, each aimed at the target. About 30 seconds after the tracer fire has been opened, the first mortar bomb falls at the intersection of the two streams of bullets. This method of target indication is fast, accurate, and has the advantage of frequently spotting targets invisible to the observation post. It is also used against enemy tanks in daylight.



NEW TYPE 105-MM MORTAR

ORDNANCE

18. GERMAN 100-MM MORTAR

a. General

A 100-mm (4-in) smoke and HE mortar, throwing a 16-pound bomb 3,300 yards and used to some extent by airborne troops, has been captured in the Middle East. While the mortar is a standard smoke or chemical warfare weapon in the German Army, HE is also fired.

Designed on the familiar German lines, the weapon consists of a barrel, baseplate, and bipod, with a total weight of 205 pounds, the three principal components being of approximately equal weight. It is, in fact, simply a larger and heavier version of the German 81-mm mortar.

There are reported to be two projectiles, one weighing 16 pounds, the other 19 pounds.

b. 19-pound Bomb

No details of the construction of the 19-pound projectile are yet available. The primary propelling charge is 154 grains of nitroglycerine flake. The augmenting charges are nitroglycerine annular propellant. Augmenting charge I contains 756 grains; charge II, 1,358; and charge III, 1,574 grains.

The propelling charges are made up as follows:

Charge I (kleine Ladung) primary and augmenting charge I
427 f/s muzzle velocity

Charge II (mittlere Ladung) primary and augmenting charges
I and II 755 f/s muzzle velocity

Charge III (grosse Ladung) primary and augmenting charges
I, II and III 1,017 f/s muzzle velocity

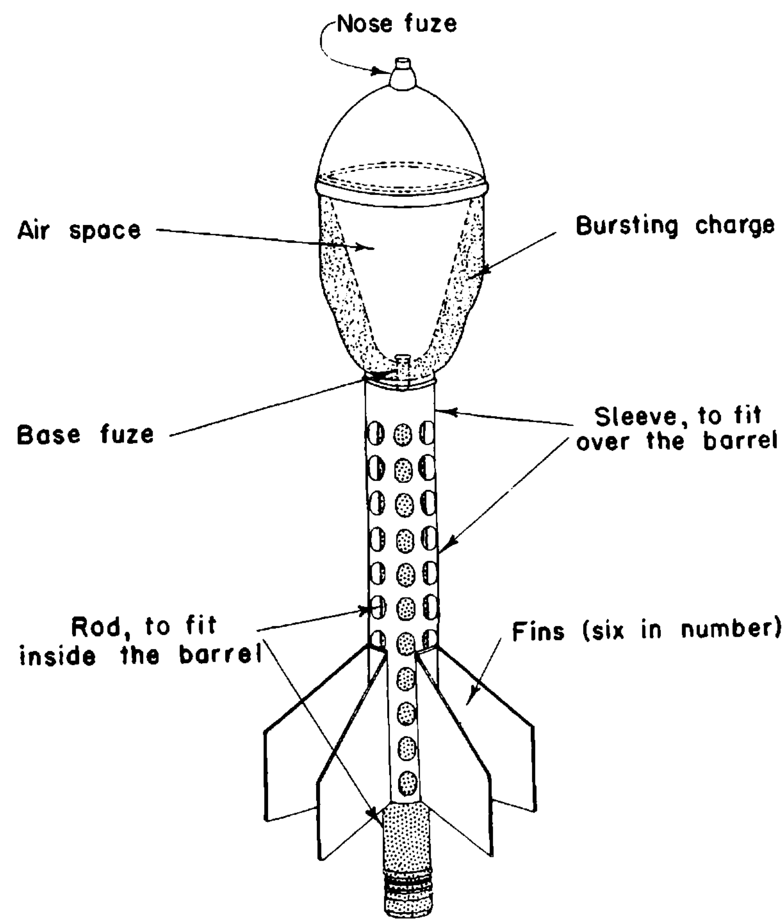
c. 16-pound Bomb

From a German document come details of a 16-pound bomb for the same mortar:

Length	17 in
Maximum diameter	4.09 in
Thickness of walls	1/8 - 3/10 in
Maximum range	3,300 yds

19. NEW GERMAN 37-MM STICK BOMB

An account of this novel development in antitank gun ammunition appeared in Tactical and Technical Trends, No. 19, p. 28. A drawing of this hollow-charge bomb has recently been made available and is here reproduced. Note the remarkably large air space in the bursting charge. There are two fuzes, one in the nose, which was described in the previous article, and the second below the base booster.



STICK BOMB
FOR 37-MM ANTITANK GUN

The object of the base fuze is probably to ensure that the bomb explodes in the event of the failure of the nose fuze.

20. GERMAN SEMI-AUTOMATIC RIFLE

Germany's reply to the M 1 is reported to be a 10-shot, rather heavy, gas-operated rifle, known as the Gewehr 41, using the regular 7.92-mm cartridge. It is hoped that further details will be shortly available.

21. ITALIAN 81-MM MORTAR AMMUNITION--WEIGHT VARIATIONS

An Italian document discloses that the Italian 81-mm mortar ammunition in actual use varies considerably in weight. At least as a partial remedy, a system of weight markings has been devised. The weight markings appear half-way up the ogive of the mortar shells as follows:

0 (less than 1 percent above or below the standard weight)
0+ (between 1 and 4 percent greater than the standard weight)
0‡ (between 4 and 7 percent greater than the standard weight)
-0 (between 1 and 4 percent less than the standard weight)
=0 (between 4 and 7 percent less than the standard weight)

The standard weight is also marked on the shell.

SIGNAL CORPS

22. GERMAN VISUAL COMMUNICATION BETWEEN AIRCRAFT AND GROUND TROOPS

Modern warfare puts a heavy premium on successful coordination of all of the various arms. For that reason, comprehensive and flexible methods of communication must be devised. Liaison between air and ground forces presents special problems, and a German document gives the following outline of methods used to meet some of the difficulties.

*   *   *

a. Cooperation

Cooperation between army and air force is to be arranged through the respective headquarters, prior to each action. The appropriate headquarters of both branches of the service are also responsible for keeping themselves mutually and speedily informed of all movements in their battle area, both on the ground and in the air.

b. Method of Recognition

Detailed knowledge of friendly aircraft types, pre-arranged signals, and the air situation, distributed down to companies, will facilitate early recognition by the troops.

When the air crews possess knowledge of the situation on the ground, of the general conduct of ground troops in battle, and of the signals arranged for, this will enable the pilot to distinguish quickly between friendly ground troops and those of the enemy.

Recognition signals can only be seen if they are given at the right moment and in the correct position.

Ground troops must give their signals early and in a position easily observed from the air. Aircraft must be able to observe the signals well before arriving over the position.

Aircraft must NOT give their signals too soon, as ground troops are often hindered in their observation by cover. Only when the ground is flat and when aircraft are flying low should early signals be given. Flying unnecessarily low over friendly troops is to be avoided, as recognition by the troops is made difficult through the sudden appearance of planes.

c. Signals

(1) Recognition of Friendly Ground Forces

Means which are employed during daytime to indicate friendly troops are as follows:

(a) Orange-colored smoke signal
(b) Yellow panels (only for the front line)
(c) Swastika flags
(d) Any other signals which assist recognition.

The orange-colored smoke is the signal most easily recognized from the air. It means "friendly troops; we are here." It is the chief recognition signal for all ground troops.

The yellow panels are in general recognizable from medium heights if they are laid out in an advantageous position. Numerous yellow panels side by side facilitate recognition. Yellow panels mean "here is our own front line." They are only to be used for this signal and NOT in any other situation, in order to ensure that the front line is clearly indicated. The aircraft can draw its own conclusions as to the battle situation. When friendly troops advance, the yellow panels must NOT be left behind.

In addition, the orange smoke signal is to be used as extensively as possible.

Swastika flags can hardly be seen from great heights, and only with difficulty from medium heights. They mean "friendly troops; we are here." They are generally used in rear positions, particularly by columns, etc., but can be used in the front line if yellow panels are NOT available or if NO particular value is attached to the distinct recognition of the front line. As swastika flags alone are NOT generally sufficient, the additional use of the orange smoke signal is advisable.

Any other signals may be used by the troops, if the usual recognition signals are NOT available. Improvised signals can include: laying out of swastika flags on snow or light background, and waving of steel helmets and hankerchiefs, etc.

These signals are, however, only an improvisation - they do not afford any guarantee that the ground troops will be recognized.

(2) Recognition of Friendly Aircraft

Means by which aircraft can be recognized are:

(a) Type of aircraft and national marking
(b) Special painting (or camouflage)
(c) Recognition light signals
(d) Any other improvised signals.

The special type of painting is usually ordered to be uniform throughout the entire air force for a fairly long period; for instance, yellow wing tips and a ring round the fuselage.

The recognition signal is changed continually and must be made known to the commands, etc.

Improvised signals can include: dipping the nose and tail of plane up and down, and repeated deceleration and acceleration, etc.

These signals are only improvised if others are NOT available and they afford NO guarantee that the aircraft will be recognized.

d. Means for Night Indication of Friendly Troops or Friendly Aircraft

(1) For Ground Troops

Flashes and light signals of all descriptions
Special light signals ordered from time to time (for short-distance, night reconnaissance aircraft

(2) For Aircraft

(a) Recognition signals and lights

(b) Fixed lights
(c) Flashes with searchlight on aircraft.

The above signals are continually changed and must be made known down to companies, etc.

e. Use of Recognition Signals

(1) Recognition signals by day must be given by ground troops:

(a) When called for by signal from air units
(b) If an attack is threatened by friendly aircraft.

The order to signal is given by the company commander; by aircraft, when fired on by friendly troops.

(2) Recognition signals by day can further be given:

(a) By ground troops, if they consider it necessary to identify themselves to the aircraft, without being called upon to do so - particularly if the position justifies the assumption that the aircraft has omitted to call for signals.

(b) By aircraft, when suddenly emerging from clouds over own territory, or as a request to ground troops to give their signals.

(3) Recognition signals by night must be given by ground troops, when called for by friendly aircraft; also, when the position justifies the anticipation of a bombing attack by friendly aircraft. The order to signal is given by the company commander; by aircraft, if in danger of attack from friendly troops.

(4) Night signals can further be given by aircraft:

(a) To ascertain own territory, if bearings are lost
(b) If it is known or believed that the aircraft are crossing the front (generally this is usual only on the return flight)
(c) As a request to own troops to give their signals
(d) In the area of an airfield, shortly before landing.

(5) In addition to these general instructions, special signals and their use in certain cases can be arranged by cooperation between flying units and ground troops.

A safety line can be arranged for a fixed period between the respective air and army headquarters. Operations in rear of this safety line can only take place if recognition of the front line is perfectly clear (with good visibility, at about 6,500 to 10,000 feet), or if the target ascertained through tactical reconnaissance immediately before the attack is free of our own troops. Night attacks on the near side of this safety line must NOT be undertaken.

The safety line should give a safety zone of at least 1,000 feet. Air force headquarters must be informed in cases where friendly troops may be in possession of captured enemy material.

f. Secrecy of Recognition Signals

The enemy may be expected to copy German signals and every soldier must NOT ONLY realize the necessity of secrecy but must also report immediately any cases where the enemy are using our recognition signals.

g. Ground Panels

A time may be laid down in orders for making signals. The aircraft may call for signals by flare. The troops may put out signals on their own accord. The order for making these signals will NOT be given by officers below the status of company commanders,etc.

These panels will be laid out so that they are always read when looking towards the front. They must be laid out in good time so that the aircraft does NOT have to circle over the battle area. They may only be lifted when the aircraft is out of sight.

The signs must be laid out on a background against which they can be clearly picked out from the air. Where possible they must be laid out in open ground,as aircraft usually observe while approaching and NOT when directly over the position. Thus, bushes, trees, etc., may prevent the signs being seen obliquely.

h. Messages by Use of Very Lights, etc.

(1) By Aircraft

(a) White Very lights - a demand to the troops to make recognition signals

(b) Green Very lights - the observer is going to drop a message "Lay out message-dropping cross or make some other indication of dropping place"

(c) Red smoke signal or red Very light - "Beware enemy antitank weapons, antitank gun, artillery, obstacles"

(d) Blue or Violet smoke signal - "Beware enemy tanks."

White and green Very lights will be fired obliquely downwards over the battle area, or approaching it.

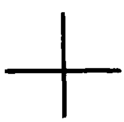
Smoke signals will be thrown by hand from the aircraft in the direction of the enemy target which has been spotted. Their direction of flight and posit will indicate the approximate target.

Improvised methods can be used, such as: the aircraft circles over the battle area several times, or flies low over the troops several times, in order to attract their attention (this is a demand for the troops to display recognition signals);diving on the enemy area in a certain direction, firing in bursts to indicate the observed target to the troops; dropping of short written message to supplement the information (messages will be dropped in message boxes which emit a yellow smoke while dropping, and on the ground). If this is NOT possible they will be dropped in message bags with a red and white streamer.

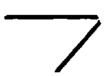
(2) By Troops

When the normal system of ground panels is NOT used, short messages can be transmitted by the use of Very lights. These signals and any other improvised methods MUST be prearranged.

GROUND PANEL CODE



Dropping station for messages and supplies



No

Have NOT understood

Have understood (Yes)

Target - number of target laid out alongside

1 

2 

3 

4 

5 

6 

7 

8 

9 

0 

The safety line should give a safety zone of at least 1,000 feet. Air force headquarters must be informed in cases where friendly troops may be in possession of captured enemy material.

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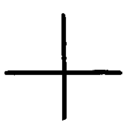
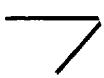
GROUND PANEL CODE

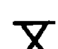
 Dropping station for messages and supplies

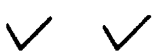
 No

 Have NOT understood

 Have understood (Yes)

 Target - number of target laid out alongside

1		6	
2		7	
3		8	
4		9	
5		0	

	Round (etc) fired
	Dropping station or position of standing patrol
	Battery ready to fire
	Battery changing to gunfire
	Battery NOT ready to fire
	Battery changing target or switching to new target
	Have ceased firing
	Fire for effect
	Enemy preparing to attack
	Enemy attacking
	Enemy have penetrated our position (in center)
	Enemy have penetrated our left flank
	Enemy have penetrated our right flank
	Enemy attack repulsed
	We are holding the line
	We are surrounded

	Ammunition required
	Support required
	Supplies required
	Gasoline required
	Water required
	We are advancing (ready for the attack)
	We cannot advance (strong enemy resistance)
	Battery or battalion
	Regiment
	Division
	Enemy point of resistance
	Enemy artillery position

These last two signs are to be laid out with the big vertical strip pointing to the enemy, and the cross strips nearest the enemy.

23. THE GERMAN CLASS "52" LOCOMOTIVE

a. General

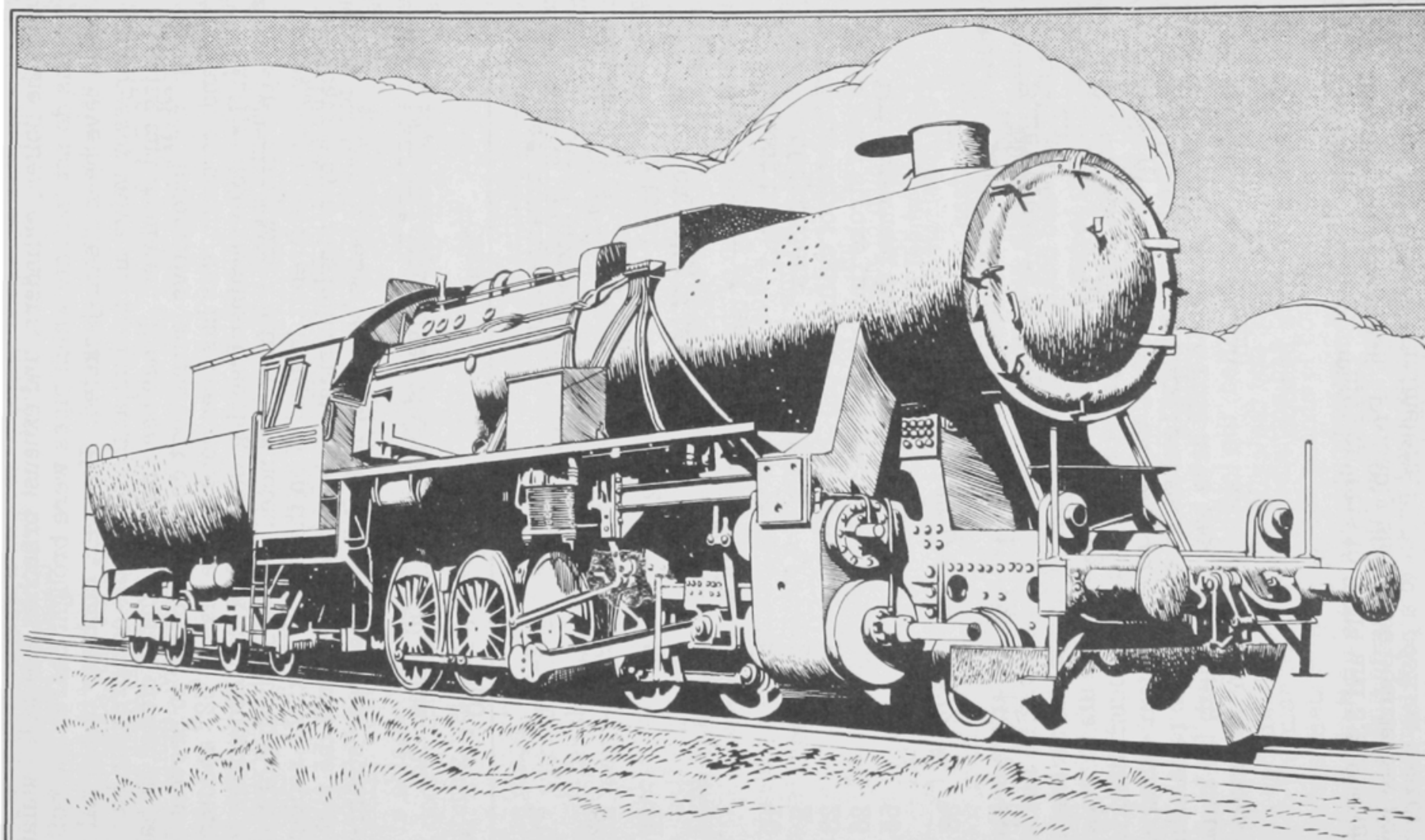
This is a summary of information and conclusions regarding the much publicized German class "52" locomotive recently adopted as standard to replace the class "50" locomotive. The information has been sifted from various German sources, some of which conflict and many of which are of a propaganda nature. Questionable statements have been eliminated as far as possible.

The evidence points to the conclusion that the earlier class "50" locomotive, for which a program of 7,500 locomotives per year was announced by the Germans in March 1942, was a transition model of a class introduced shortly before the war and was only intended as a stop-gap to tide over a critical period. As proof of this, in the accounts of the class "52" locomotive there are several references to a "transition" model, and the photographs which have appeared in the German press are believed to have been of this simplified class "50" locomotive. Furthermore, technical experts severely criticized the older design from available photographs, particularly on the ground that the frame was light and the cylinder saddle weak. The class "52" locomotive is apparently stronger in these respects. In further evidence that the class "50" locomotive, which was light, was constructed as a temporary expedient to provide means for rapidly increasing production, the German press announced that the first of the class "52" locomotives left the factory early in September--although the design and subsequent production of the model class "52" locomotive is estimated to have required 15 months. Evidently considerable progress had already been made on class "52" at the time that the simplified class "50" was temporarily adopted as a standard model.

b. The Design of the Class "52"

A comparison of photographs of the classes "50" and "52" shows that, contrary to German press accounts, they are lighter models of the class "44," and have the same basic design. In comparison with transition class "50" the new class "52" has a deeper frame, stiffer cylinder saddle, and a welded tender of the modified Vanderbilt, frameless type in place of the riveted type carried on a frame. The bracket for the valve motion has been stiffened by a bridge girder between the bracket and cylinder. A snow plough has been fitted to the locomotive. The smoke deflector plates, the forward steam dome which contained the preheater, the feed pump, and the feed water heater have been eliminated. It is evident that the side and main rods have been redesigned; the brake rigging and similar apparatus are simplified; the locking device on the smoke box has been replaced by a ring of cleats; and the cylinder-exhaust branches are rectangular instead of circular in cross section.

The class "52" locomotive is claimed to be more effectively protected against freezing than the class "50," by thicker lagging, steam jackets around exposed piping, and transfer of exposed parts to a position nearer the boiler. Although it is difficult to verify all these claims from photographs, it appears



GERMAN CLASS "52" LOCOMOTIVE

that the boiler, cylinders, and exhaust branches are well insulated. The photographs do not indicate which pipes were brought nearer the boiler or which pipes have been steam-jacketed. However, contrary to normal practice the air-compressor valve mechanism at the top of the compressor has been covered by a casing and insulated. It has been reported that a closer fit has been made on class "50" locomotive journal-box covers in order to prevent snow from entering, and, no doubt, this has been done on the class "52" locomotive also. The precautions taken against freezing would adapt the locomotive for service on the Eastern Front. Minor differences noted are the mounting of the headlight generator above the firebox instead of on the smoke box; the replacing of two oil lubricators by a single lubricator above the boiler; and the fact that the sand dome, instead of being separate, is inclosed by the rear steam-dome casing.

c. Data on Locomotives of Class "44," "50," and "52"

Class	"44"	"50"	"52"
Wheel arrangement	2-10-0	2-10-0	2-10-0
Weight of locomotive, empty (long tons)	99.5	80	82
Weight of tender, empty (long tons)	28.5	26	18
Water capacity of tender (gal)	7,930	6,870	8,980
Fuel capacity of tender (long tons)	10	8	10
No. of cylinders	3	2	2
Diameter of cylinders (in)	23 5/8	23 5/8	23 5/8
Piston stroke (in)	26	26	26
Driving-wheel diameter (in)	55 1/8	55 1/8	55 1/8
Leading-wheel diameter (in)	33 1/2	33 1/2	33 1/2
Wheel base, incl. tender (ft and in)	62' 11 1/2"	61' 11 3/4"	61' 11 3/4"
Boiler pressure (kg per sq cm*)	233	227	227
Grate area (sq ft)	50 1/2	42	42
Total heating surface** (sq ft)	2,551	1,912	1,912
Superheater heating surface (sq ft)	1,076	685	685
Maximum speed (mph)	50	50	50

*Information as received. This converts to 3,314 and 3,229 pounds per square inch, which is much too high. Probably should be pounds per square inch instead of kilograms per square centimeters.

**This is probably evaporative heating surface.

d. Comments on Data and Weights

As shown in the table, the locomotive class "52" without water in the boiler is 2 tons heavier than class "50," contrary to some accounts that both are of same weight. The class "52" tender is lighter, but has a larger fuel and water capacity.

The main reduction in weight obtained in class "52" is effected by adopting the frameless tender of welded construction, mounted on two trucks with roller bearing axles. The lower portion of the tender is of half-round cross section; the upper portion is flat sided with a curved roof plate. The elimination of the feed water heater effects a reduction in weight of 2,100 pounds, while a further reduction is obtained by simplified rods, substituting cleats for the lock on the smoke-box door, reducing the number of parts in the locomotive, and probably by substituting welding for rivets and bolts.

Although the class "52" locomotive is believed to be actually heavier than the class "50" without the tender, press accounts refer to marked savings in the weight of semi-finished parts required to produce finished parts. The following intermediate (semi-finished) and net (finished) weights can be deduced from the information given:

Weight in Tons (2,240 lbs) of Semi-Finished Parts
to Construct the Locomotives

	Locomotive			Tender			Locomotive and Tender		
	Int.	Net	Diff.	Int.	Net	Diff.	Int.	Net	Diff.
Class "50"	123	80	43	42	26	16	165	106	59
Class "52"	114	82	32	26	18	8	140	100	40

If the expected output of 7,500 locomotives per year is attained, 187,500 tons of material would be saved at the 25 tons per locomotive shown in the table. A reduction of 16 tons of the total of 25 is accounted for in the tender. Part of the economy in weight of the locomotive is achieved by the use of drop forgings instead of hand forgings for the whole of the valve-motion gear and side rods, and throughout the brake rigging. Reference is also made in German accounts to economy of material by using plain instead of forked ends in the motion gear, and by the adoption of a "gas tube in place of the firebox wrapper plate" (probably an arched, firebox crown sheet).

According to German accounts, a reduction has been secured in the quantity of non-ferrous metals by using 495 pounds of copper in the class "52" as against 1,600 pounds in the class "50" locomotive. It is claimed that 840 pounds of this reduction has been accomplished by the substitution of steel-backed for bronze-backed bearings for the 2 big-ends of the main rod and for the 10 axle bearings, and that a further saving of 55 pounds of copper is obtained by substituting a steel casing for the former bronze steam-whistle casing.

It is further claimed that 138 pounds of tin were saved in the steel-backed bearings, and 2 pounds of tin in using the steel whistle casing, although the main economy in tin as compared with the class "44" is the result of the replacement of plain by ball bearings for the tender axles.

e. Reduction in Labor Requirements

Careful consideration has been given in the design of the class "52" locomotive to economy in man-hours required for its construction. After comparing various reports, it is estimated that a class "52" locomotive can be built in 24,000 man-hours, representing a building period of about 10 weeks, as against 30,000 man-hours for class "50" and 60,000 man-hours for class "44." The economy of 6,000 man-hours is an estimate based on the prototype model, and not a figure based on actual experience. The 24,000 man-hour figure might possibly be attained in the largest and best-equipped plants, but it is practically certain that well over 30.000 man-hours will be required in many of the smaller European plants.

There is no doubt that a welded tender of the frameless type could be built in about half the time required for the framed type. The wide adoption of drop forgings and changes of design to reduce machining would lead to economy in labor. The following table compiled from data in the German press shows certain features in class "44" and "50" locomotives which have been changed in the "52" class, with the resultant saving in intermediate weight and man-hours.

Class with which the "52" is compared	Part	Remarks	Intermediate Weight saved	Man-hours saved
Class "44"	2 safety couplings	Eliminated	128 lb	40
Class "44"	Smoke-box door lock	Replaced by cleats	181 lb	3
Class "50"	Hand rails or running boards	Nine eliminated	234 lb	12.5
Class "44"	Bell	Eliminated	33 lb	10
Class "50"	Eight coupling rods	Drop-forged instead of hand-forged	10,400 lb	632
Class "50"	Steam dome with feed water heater	Eliminated	2,100 lb	174
Class "50"	Two smoke deflector plates	Eliminated	1,950 lb	110
Class "50"	Two connecting rods	Built up from two drop forgings and rolled section, instead of hand-forged	2,600 lb	79

Reports claim a reduction in machining time of a cylinder block of from 28 to 4 hours, and it is claimed that a futher reduction to 1 hour will be attained upon completion of a special machine. A highly specialized tool for machining locomotive cylinders would be very costly to build, and it is doubtful whether the German machine-tool industry is now in a position to accept orders for such a machine. If such tools were manufactured, only a limited number of plants could be equipped with them. Due to the transport difficulties involved, the machined cylinders would hardly be shipped to factories distributed throughout Europe. Too much weight need not be attached to actual figures given; however, they show that every attempt is being made to economize in labor and speed up production.

It is stated in one report that by limiting the finish to one coat of paint, 235 man-hours have been saved.

f. Production of Class "52" Locomotive

A paper entitled "Estimated Main-Line Steam Locomotive Output in Axis Europe," based on the class "50" design, gave an annual output of 3,400 locomotives by the end of 1942, 4,040 by July 1943, and 6,040 by the end of 1943, on the assumption that all class "44" locomotives under construction when the plan was announced would be completed, and that all future locomotives would be of the simplified class "50" design. However, the adoption of class "52" as standard modifies these estimates.

Although the tender of class "52" could be built in about half the time of the class "50" tender, this would not appreciably affect the relative production rates of the locomotives proper. The following points should be considered: (a) modifications in design for greater output, (b) modifications in methods of production, and (c) extension of subcontracting.

The conclusion already stated on the first two points is that through these modifications, the class "52" engine can possibly be built in 24,000 man-hours as against 30,000 man-hours for the class "50" by the largest and best-equipped works, providing drop forgings are used in place of hand forgings and that they can be obtained without delay. If the locomotives are built in a number of scattered minor works, as appears likely, such forgings will have to be obtained from outside shops in a great many cases. Due to difficulties of regular supply, the economy in man-hours resulting from use of drop forgings will be a maximum of 10 percent and will most probably average about 5 percent. The production of the necessary dies for the drop forgings will lead to some delay, resulting in a small drop of the estimated locomotive output in first half of 1943, followed by a rise to about 6,400 instead of 6,040 by the end of the year. If the above assumptions are correct, the chief advantage of the new class "52" design over the class "50" will not be an increase in production, but the substitution of a sound for a defective design as a standard production model.

Considering the last point, there is very little reliable information on which to base an answer to the question whether the Germans can increase locomotive output by subcontracting beyond the present estimated 10 percent. Reports have

been received of proposals to convert the leading European locomotive works to assembly plants, with all components made either in other locomotive works or in plants not hitherto engaged on locomotive production. If this is done, the machine capacity of selected plants would be lost or used for purposes for which the plants were not laid out. Also, a carefully synchronized plan would have to be worked out to cover movement of parts over a transport system that is already heavily taxed. Considering that the delivery of locomotives from some leading French works is months overdue owing to various unexpected difficulties, the required degree of synchronization would be nearly impossible to obtain.

Press accounts, apparently referring to the class "50" locomotive, refer to 18 percent of the total man-hours being performed by subcontractors at the present time. Such component parts of locomotives as air compressors, feed pumps, injectors, and parts of the braking apparatus have usually been obtained from an outside firm. Some of the smaller firms obtained even the boiler from an outside source, and it is difficult to deduce whether the figure of 18 percent includes these parts or only parts normally manufactured by the locomotive builder. Some European works have always made a practice of subcontracting locomotive tenders, and a few have subcontracted boilers.

Until it is established that the 18 percent is in fact over and above the figure accounted for by subcontracting before the war, the figure of 10 percent additional output obtained by subcontracting should be used when estimating total output.

g. Utility Value of the Class "52" Locomotive

The conclusion drawn from published data and photographs is that the class "52" locomotive appears to be of sound design throughout, and should have a useful life comparable with prewar engines.

The elimination of the feed water heater at a sacrifice of approximately 7 percent in thermal efficiency will increase fuel costs but reduce maintenance. The elimination of safety couplings and bell, and the use of thin tires, are justifiable in wartime, and there will be no difficulty in changing these parts at a later date. There is no evidence that the class "52" locomotive has been designed for a short working life. The retention of extension piston rods to reduce cylinder wear on class "52" is direct evidence to the contrary.

From the viewpoint of normal continental practice the class "52" is a light model of moderate power, suitable for operating branch lines and local services, but not suitable for heavy, main-line post-war traffic in the Reich.

From German accounts, the construction of the class "42" is to be initiated in 1944 for heavy service. This class has never previously been built in quantity but it is thought to be comparable in performance to the class "44." It is thought probable that if the class "42" is built, the class "52" locomotives will also be continued in construction.

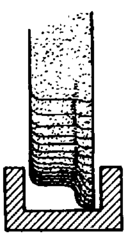
24. NEW-TYPE GERMAN MOVABLE RAIL

Railroads are one of the major means of transportation and as such play an important part in military operations. On the Russian front the problem of rail transportation is complicated by the fact that German rolling stock is designed to standard-gauge track, while the Russians use the wide gauge. To meet this difficulty, one of the principal functions of the Todt organization* in Russia has been the alteration of Russian trackage. The following report on a new-type German rail is therefore of interest.

A press correspondent recently returned from a visit to the Stalingrad front, reports that he noticed on a siding a new type of movable rail used by the Germans to increase the siding capacity of the particular station indicated.

These rails are described as "U" shaped channel irons, simply placed on top of the frozen ground and bolted end to end. There were no lateral supports.

The correspondent was unable to give measurements, but he stated that the interior width of each channel rail was sufficient to permit the wheel of the railway car to roll freely, and that the weight on the wheel was supported by the flanged end which normally carries no weight since it is inside the rail.



The cross-section shown indicates approximate relative dimensions. Since the ground was frozen at the time, there was sufficient support for the rails placed in this manner, but it would seem that some kind of ballast would have to be provided in summer or wet weather.

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*Semi-military construction corps.

SECTION II

NOTES ON GERMAN ARMORED UNITS

NOTES ON GERMAN ARMORED UNITS

The following pages contain an edited translation of training notes on some of the tactical courses given at the Panzer Troop School (School of Mobile Troops, at Wünsdorf, Germany). Though dealing specifically with armored units, this material should be of interest to all branches of the service.

The types of German tanks mentioned below are the PzKw 2, 3, and 4. The PzKw 2 is a 10-ton tank capable of about 35 mph, usually equipped with one 20-mm gun and a machine gun. The PzKw 3 is a 19-ton tank with heavier armor, and with a speed of about 28 mph; it is usually equipped with a 50-mm gun and 2 machine guns. The PzKw 4, with still thicker armor plate, weighs 21 to 22 tons, and has one 75-mm gun and 2 machine guns; its top speed is 22 mph.

*   *   *

I CLOSE RECONNAISSANCE BY A TANK REGIMENT

a. General

(1) Close reconnaissance by the tank regiment will be carried out for the benefit of the regiment only.

(2) For this mission the following units are available:

The PzKw 2s of the light tank platoons in the regimental and battalion headquarters companies.*

The motorcycle reconnaissance platoons of the headquarters companies.

Moreover, all crews of light and medium tanks** must be qualified to carry out close reconnaissance when conditions permit.

(3) The PzKw 2 tank is entirely suitable for cross-country work. On account of its stronger armor it is superior to the armored reconnaissance car, although this car carries a gun of larger caliber. According to the situation, the tank is expected to defeat a numerically stronger but unarmored enemy who is not prepared for defense.

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* Regimental and battalion headquarters companies include a light tank platoon equipped with PzKw 2s.

**Probably has reference to tanks in the tank companies. In this connection it should be noted that the light PzKw 2 is no longer included in the tank company. The light tank company is now equipped only with PzKw 3s, and the medium tank company with PzKw 4s.

As the enemy may well suspect the presence of a tank unit if one or more tanks are sighted, battle or tactical reconnaissance by tanks is not permitted when an armored attack is contemplated against an enemy with well-prepared defenses and a high morale. In this situation, the reconnaissance is carried out by motorcycle platoons. For this reason, in many cases squads of the motorcycle reconnaissance platoons in battalion headquarters companies form a valuable supplement to the light tank platoon--for example, with motorcycle reconnaissance elements in front of a point of light tanks.

(4) The light tank platoons are equipped with radio transmitters and receivers, but the range is short. If the ground to be reconnoitered is beyond the radio range, motorcycle messengers must be added or relay radio stations established.

b. Orders for Reconnaissance

(1) Close reconnaissance is ordered by the regimental commander as a matter of routine. He directs the assembling of the patrol.

(2) Orders for the patrol should include:

Information concerning the enemy, as known to the officer issuing the order;

Plan of operation, including the time phases during the reconnaissance;

Mission for the patrol, together with the route and measures to be taken in case of road blocks, mines, and enemy contact;

The missions, routes, and reconnaissance limits of other patrols;

Duration of the reconnaissance;

Means of communication;

Where to rejoin the command;

Where messages may reach the commanding officer.

(3) Composition of Patrols

As a general rule, patrols will be formed from motorcycle reconnaissance squads of the headquarters companies. They are trained to cooperate properly. These patrols must be especially strong if contact with the enemy is expected and it is necessary to fight for information.

While the regiment is on the march, at rest periods, during alerts, and after the objective has been reached, parts of the motorcycle platoons and of the light tank platoons will be used for security missions.

When attacking an enemy whose strength is uncertain, or after a successful break-through, the light tank platoons of the leading battalions will be employed as patrols.

II NOTES ON MISSIONS AND OPERATIONS OF TANK PLATOONS

Although brief, the following outline suggests main points covered in the tactical training of German tank platoons, particularly with regard to the character of missions assigned to these units. The original notes were accompanied by references, omitted here, to German training documents and manuals.

a. Combat Platoons

(1) Ordinary Operations

Point platoon (alone or in cooperation with motorcycle reconnaissance platoon).

Attack against heavy infantry weapons.

Attack against artillery.

Attack against infantry:
- While the platoon is in motion;
- From a prepared position.

Close support of friendly infantry:
- After the second wave, or echelon, of tanks has passed friendly riflemen;
- Riflemen of armored units.

Fighting for an important terrain feature.

Battle against enemy tanks:
- Evenly matched;
- Against heavy odds;
- Unexpected encounters;
- Enemy tanks surprising our own;
- Our own tanks surprising enemy tanks.

Advancing during attack, but behind our own front line.

Conduct of an armored unit which has reached its objective.

Transition from attack to defense.

Defense against close-in attack.

(2) Special Operations

Attack against permanent fortifications.

Attack against a river line.

Attack against villages and wooded areas.

Combat at night or in fog.

Procedure on encountering mines.

b. Light Tank Platoon*

(1) The Individual Tank

When attacking an insufficiently reconnoitered enemy.

After breaking through the enemy infantry zone.

After reaching the objective.

Security in bivouac, or in prepared positions subject to attack.

(2) The Unit

Unit as point, or flank guard.

Reconnaissance for determining terrain and enemy position, as the basis for the beginning of an armored attack.

After a successful penetration of the enemy infantry zone, determination of hostile dispositions and nature of the terrain to the front and flanks.

After reaching its objective.

Reconnaissance to determine the enemy's position during the counter-attack.

The unit, reinforced with engineers, to make surprise attack to capture a bridge, blow up railroads or bridges, or lay mine obstacles.

---

*Part of regimental and battalion headquarters companies; platoon is equipped with PzKw 2s.

III

ORDER OF MARCH OF A TANK BATTALION OF THREE COMPANIES AS ADVANCED GUARD

RECONNAISSANCE*	3 PzKw 2s (from Bn L Tk Plat) and Mtrcls	
	Variable distance (not to scale in this diagram)	
POINT	1 Plat PzKw 3s (from 1st Co) and Mtrcls	350 meters
		2,000 meters (6 min)
SUPPORT	1st Co (-)** 1 Sec of 4th Co Maint Sqd	1,000 meters
		3,000 meters (9 min)
RESERVE (25 meters between vehicles; more between units)	(see below)	3,775 meters

RESERVE (25 meters between vehicles; more between units)

Bn Hq	250 meters
Mtrcl Rcn Plat (-)	250
Bn L Tk Plat (-)	125
Sig Plat	100
Engr Plat	150
AA Plat***	100
4th Co M Tks (-) † and Maint Sqd	750
2d Co and Maint Sqd	1,000
Bn Med Det	100
Bn Maint Sec	100
Combat Tn ††	850
	3,775 meters

TOTAL 10,125 meters

*It may be that this should be regarded as the point of the advance guard, in which case the "point" becomes the advance party. The original document is not clear.
**At the date of this document the L Tk Co probably included 1 Plat of PzKw 2s; the Co now includes 3 Plats of 5 PzKw 3s each with 2 PzKw 3s in Co Hq.
***Elements of this Plat are scattered through the column.
†PzKw 4s (75-mm guns). The 4th Co usually contains the heaviest Tks in the Bn and is called "4th" even in a Bn of 3 Cos.
††Includes up to 15 fuel and lubricant Trks, 5 Am Trks for reserve personnel, 5 equipment Trks, 3 F Kis. The remainder of the Tn follows at a position designated in the march orders.

IV ORDER OF MARCH OF A REINFORCED ARMORED INFANTRY BATTALION
(Acting as Advance Guard; Speed, 20 mph)

RECONNAISSANCE		Elements of Div Mtrcl Bn <u>or</u> of L Tk Plat and Mtrcl Plat of Regt	
	Variable distance (not to scale in this diagram)		
POINT		1st Sqd	50 meters
	1,000 meters (1 to 3 min)		
ADVANCE PARTY		Plat Leader and Msgr	50 meters
		1 AT gun	40
		2d Sqd	70
		1 Sqd Engr Plat and 1 Hv Mort	100
		3d Sqd	70
		TOTAL	330
	2,500 meters (4 to 6 min)		
SUPPORT		Co Comdr, Hq, and 1 Radio Car*	
		2d Plat	300 meters
		Arty Obsr	70
		Hv Wpns Plat (less 1 Hv Mort)	300
		3d Plat	300
		TOTAL	970
	4,500 meters (8 to 10 min)		
RESERVE		Bn Comdr, Msgr Det and 1 AT gun**	
		2d Co	1,550 meters
		Bn Stf (2d Ech) and Sig Plat	650
		4th (Hv) Co† (less 3 AT guns and 1 Engr Sqd)	1,300
		1 Plat, Hv Wpns††	240
		1 Arty Btry	700
		3d Co	1,550
		1 AT gun	10
		TOTAL	6,000

TOTAL ROAD SPACE (not counting reconnaissance elements) 15,350 meters
TOTAL TIME TO PASS GIVEN POINT (approx.) 30 min

*These move in the space between advance party and support, regulating their speed to suit the position desired.
**These move in the space between support and reserve, regulating their speed to suit the position desired.
†This unit is a Regtl organization and includes an AT Plat (3 37-mm AT guns), an Inf gun Plat (2 75-mm infantry guns), and an Engr Plat.
††This Plat is probably from the Regtl Cannon Co which at one time had 4 75-mm Inf guns and 2 150-mm Inf guns; it is now equipped simply with 4 150-mm infantry guns.

V NOTES ON MARCH DISCIPLINE OF MOTORIZED TROOPS

a. The Fundamental Principles for the March of Smaller Units

(1) Mounting up, Starting, and Halting

Everyone will sit quietly after mounting the vehicles. At the signal or command "Forward," the vehicles will be set in motion. If possible, all vehicles should begin to move at the same time. Vehicles which fail to move off with the others cause confusion. Therefore, a preparatory signal should be given. As they move out, all vehicles will follow the leading vehicle at the designated distance. The minimum distance should be 20 meters. During halts, distances are in no case to be less than 20 meters. This distance may be shortened to 5 or even 2 meters when the tactical or traffic situation so demands.

Besides the driver, all vehicles will have assigned to them leaders who are responsible for the transmission of signals. The following signals will be used: "Slow down;" "Turn to right;" "Halt;" "Turn sharply to right;" "Take cover from air raid;" "Turn left." Personnel are always to dismount on the right-hand side. Crossings, curves, etc. are to be left clear. Traffic control personnel are to be posted along the line of march.

(2) Distances

Distances are to be not less than 20 meters. If the distance is too great, vehicles are to proceed at gradually increased speed to close the gap, rather than racing ahead. Platoon leaders must keep control of their units. The observance of the regulation distances is not to be rigidly insisted upon; the type of vehicle, route, and terrain are to be considered. Distances of 50 to 150 meters are to be maintained between units (i.e., companies, etc.). The signals, "Take more distance" or "Close up" should be given only in exceptional cases. The basic principle is to give as few signals as possible; otherwise march discipline will become lax and drivers will pay no heed to the signals.

(3) Speed

This depends on the condition of the road, and on the terrain, weather, and type of vehicles. Average speed is not to be insisted upon; however, the speed of the leading vehicle should be set by order. The following table may serve as a guide in fixing the speed of the leading vehicle:

For units with a preponderance of:

	DAY	NIGHT
Full-track vehicles	20 km ph (12 1/2 mph)	12 km ph (7 1/2 mph)
Half-track vehicles	30 km ph (18 1/2 mph)	15 km ph (9 1/2 mph)
Four-wheeled vehicles	35 km ph (22 mph)	18 km ph (11 mph)
Motorcycles	40 km ph (25 mph)	20 km ph (12 1/2 mph)

Vehicles move off at a slow speed, which is then gradually increased when the whole unit is in motion. Speed is not to be increased or decreased too suddenly. Even very brief halts in front will unfavorably affect the rest of the column.

(4) Passing

The overtaken vehicle must pull over to the right and give the "go ahead" signal, and must not increase its speed. Columns may be doubled without special permission by: single vehicles with officers, personnel moving forward to receive orders, messengers, medical and veterinary officers, supply sergeants, signal personnel, and staff personnel with appropriate command flags. Marching columns must not be overtaken by another column. Stationary or slowly moving columns may be doubled only if their commanders are consulted first, or if an order to this effect issued by a higher authority is produced. A halted column must not be put in motion while it is being passed.

(5) Turning

To turn around, individual vehicles will veer sharply to the right and then turn. The lead vehicle again takes position at the head and the units follow in the old order, or in the order in which they find themselves after making the turn.

(6) The Last Vehicle and Dropping Out

The rear of every unit is brought up by a vehicle carrying an officer or a senior NCO. He decides whether or not vehicles which have dropped out should remain behind, and he reports his decision to the unit commander. He prevents unauthorized passing of the column by other columns when it is halted. The last vehicle must display a red-and-white light at night. Vehicles which have dropped out will get off the road, hoist the "drop-out" flag, and motion other vehicles to pass. Maintenance sections will repair minor defects, or order the drivers to do so. When these have been repaired, vehicles must not double other columns to catch up, but must attach themselves to the nearest unit and then proceed to their own units at the next scheduled halt.

(7) Night Marches

Vehicles using their parking lights will proceed at moderate speed. Under certain circumstances distances are to be decreased and the units separated. Careful route reconnaissance and traffic posts are essential. Signals are to be given with the flashlight. The same principles apply in case of fog.

b. Basic Principles for the March of Larger Units

(1) Preparations

Advance route reconnaissance should be initiated. The condition and width of roads, bridges, cover, etc., are to be reconnoitered. The effects of sudden freezing or rain should be considered. All personnel, and the drivers in

particular, must be well acquainted with the route and destination. The march order must include: the route, destination, order of march, place and hour of assembly for the march, halts and rests, reconnaissance, security measures, regulation of traffic, and administrative details.

(2) Assembling at the Initial Point

A timetable is to be drawn up. An initial point must be designated outside the bivouac area, but in the direction of the march. Before the column is assembled a representative from each unit must contact the liaison officer of the unit that is to precede it. The crossing of columns is to be avoided. Lining up without confusion is to be demanded. A short halt is to be made at the initial point. Jamming at the initial point is to be avoided. If possible, there should be no assembling and halting on the road or route to the initial point.

(3) The March

Long columns will be split up into a number of march groups. These travel with considerable distance between groups. These distances must not be shortened by vehicles from the rear groups closing on the group in the front. Any differences in distances due to varying rate of speed are to be adjusted at the next halt. It is the duty of every officer to take energetic measures in case of traffic jams.

(4) Halts

Twenty-minute halts should be ordered every two hours. As a rule they take place on the road. Vehicles should park on the extreme right of the road and cover should be sought. The vehicles are to be inspected. Special halts for maintenance purposes will not be provided for.

(5) Rests

Rests should be ordered every 4 or 5 hours and should be of at least 2 and 1/2 hours' duration. Time and space should be considered when ordering rest periods. If the march is properly regulated as to time, everyone will be able to adhere to the time schedule and get off the road to take cover. During rests an officer collects messages from every company for the information of the column commander on the condition of vehicles, oil and fuel supply, etc. During the rest, the fuel tanks are refilled, minor repairs undertaken, and the troops fed. Roads should be cleared for the resumption of the march.

(6) Traffic Regulation

Each unit is responsible for the regulation of its own traffic. Motorcycle messengers, squads, or even whole platoons may be assigned to regulate traffic. In case of large units, the higher echelons may establish traffic control. The regulations issued by higher echelons must be strictly adhered to. The responsibility for the regulation of traffic must be definitely assigned by order.

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TACTICAL AND TECHNICAL TRENDS

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SECTION I

1. ITALIAN CANTIERI Z 1007

Used as a bomber and reconnaissance plane, the Italian Cantieri Z 1007 has recently appeared in two different versions. Similar features include an all-wood cantilever construction of the mid-wing monoplane type, a length of 61 ft. 3 in., and a long nose. The wings have a sharp dihedral with a span of 81 ft. 10 in. and a gross area of 810 sq. ft. They are in three sections built upon two wooden box-spars with stressed plywood covering. The fuselage is semi-monocque of wood with stressed covering of poplar plywood. In one type the braced stabilizer is elliptical, with "V" cut-out and a wide single fin and rudder. The other type has an angular stabilizer with oval, out-rigged twin fins and rudders. The landing gear is retractable.

Both planes are powered by three 14-cylinder, radial Piaggio PXI RC-40 air-cooled engines, one in the nose of the fuselage and one on either side in the wings, giving a maximum speed at 15,000 feet of 280 mph, and a cruising speed of 235 mph. The range is approximately 400 miles with a full bomb load of 4,850 pounds. An improved model of this engine with 1,300 hp may be fitted and would increase the maximum speed to about 300 mph at 13,000 feet.

The armament consists of two 12.7-mm machine guns (one Isotta-Fraschini "Scotti" in the dorsal turret and one Isotta-Fraschini in the rear) and two lateral 7.7-mm Breda machine guns. The normal bomb capacity is 2,640 pounds, and the maximum load is 4,850 pounds.

The hand-operated turret is traversed by means of a wheel mounted at the lower end of an inverted control column. Operation of the wheel rotates the turret, while movement of the column gives elevation or depression. Elevation is from 0 degrees to approximately 70 degrees. A light metal rod mounted to project upwards though the perspex dome helps to balance the relative wind pressure on the gun barrel and gives the impression of two guns firing in opposite directions.

The shallow cupola, which projects above the top line of the fuselage, is of thick, transparent plastic material, and has a flat panel inserted for better sighting. There is no bullet-proof glass, but for the protection of the gunner there is a large curved sheet of armor plate (2 ft. 6 in. by 3 ft. 6 in.) 8 mm thick, which turns with the turret and protects the gunner's body. A smaller curved piece, 14 in. by 8 in., gives partial protection to his head. The gunner's seat is thought to consist of a single padded sling, hanging from the turret and rotating with it.

The lateral gunners' positions are protected by pieces of 5-mm armor plate on the side of the fuselage, and each lateral gun has three small pieces of 6-mm armor plating attached to the gun itself. The ventral gun position is also protected by 6 mm of armor.

Radio equipment of a new type incorporates an intercommunication amplifier A. 40 which replaces the speaking-tube system to which the Italians have adhered for so long, and is operated by the radio operator. In addition, provision is made for the latest fighter radio set (B.30) to be fitted, but no part of this equip-

ment has been actually installed.

Six self-sealing tanks are carried in each wing. The self-sealing system consists of covering the light-alloy metal tanks first with felt, then with two layers of black sponge rubber, and finally on the outside with yellow canvas. There is an unprotected oil tank behind each engine.

Apart from the gunners' armor already referred to, 5-mm armor is fitted in the roof over the front pilot and on the port side of the cockpit. The rear pilot is protected by a seat consisting of 6-mm plate and a piece of 5-mm plate over his head, as well as a bulkhead of 6-mm plate just aft of the lateral guns. This bulkhead does not fill the whole cross section of the fuselage but is of horseshoe shape.

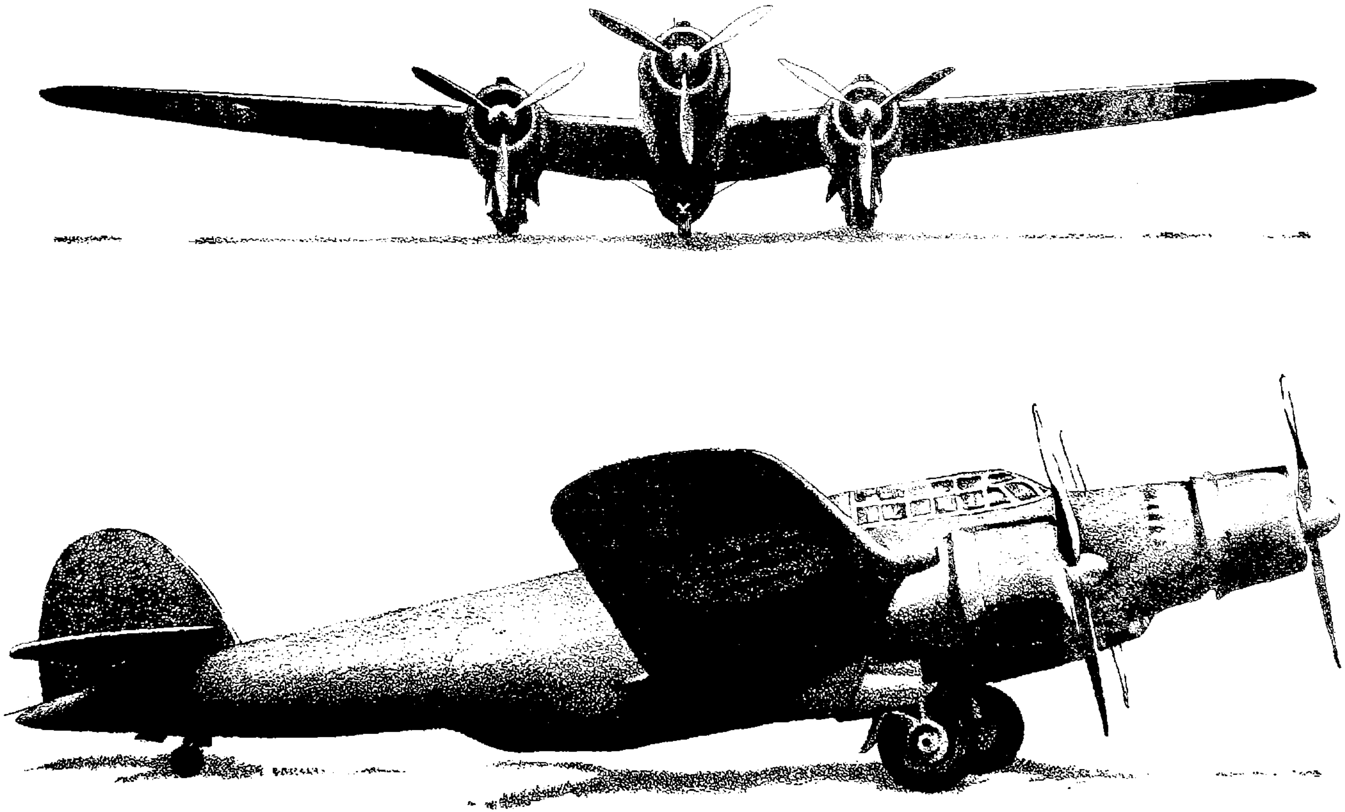
A recently-crashed Cantieri Z 1007 was found to have a Breda turret rotating by an electric motor. This motor was mounted behind the control panel to the right of the gun, which was on the left side of the turret and was fired hydraulically. Elevation and depression were effected by a hydraulic jack. The arcs of fire were probably 360 degrees in azimuth and 0 to 90 degrees in elevation. A San Giorgio reflector sight of a new type, smaller than the usual one, was fitted, and had its own speed-control mechanism. New-type exhausts were fitted similar to those on a Beaufighter, two pipes to each engine, and it is thought that they fitted on either side of each nacelle below the wings.

Internal racks for twenty 110- or 220-pound bombs were carried, apparently the electrical-release type. Stowage for three 110- or 220-pound bombs was found inside each wing, outboard of the engine nacelles, operated by rotating shaft control. All the bomb locks were the same type and could be operated either electrically or mechanically. It is thought that the wing racks were not in use, as no bomb steadiers had been fitted.

2. A NEW-TYPE JAPANESE MEDIUM BOMBER

A new Japanese twin-engine, medium bomber has been reported recently shot down in India. It is believed to be designated as Type 97 Mark II, manufactured by Mitsubishi, an improved version of the Type 97 twin-engine bomber, "Sally", re-engined and with improved armament, carrying a crew of seven.

The span of this new bomber, given as 74 ft. 10 in., is a little greater than the Type 97. The length of 48 feet is slightly less. It is a mid-wing monoplane with engines centrally slung, the nacelles being slightly longer under the wing to house the backward-retracting oleo-legs. It has a single fin and rudder. The main plane is of boxspar construction, with the trailing edge tapered more than the leading edge and with a small dihedral angle. It is of stressed skin metal construction, with the exception of the control surfaces, which are of the conventional metal



CANTIERI Z 1007

frame construction, fabric-covered. There are split trailing edge flaps 14 ft. 4 in. long and 2 ft. 7 in. wide, starting at the fuselage with ailerons directly outboard of these in two sections and reaching almost to the wing tips. It has a perspex nose and a turret on top of the fuselage towards the tail.

Name plates on the engines state that they are the Mitsubishi Type 100, with 1,450 hp. This engine, apparently an improvement on the Kinsei engine in the Type 97, is a 14-cylinder, twin-row, air-cooled radial 52 inches in diameter, with a deep reduction-gear casing, and probably fitted with a two-speed supercharger, giving a superficial resemblance to the Wright Double Cyclone. The propellers are the three-blade metal type, with electrical pitch-changing mechanism operated by a motor on the forward end of the boss and enclosed in the spinner.

The armament in the new aircraft is reported to be considerably heavier than hitherto encountered in any Japanese bomber, although no armor is apparently provided.

A 7.7-mm Lewis-type machine gun is gimbal-mounted in the nose within an eccentric ring, in the same manner as in the He-111. Similar German influence is apparent in the design of the dorsal turret, which is like that of the Do-217E-2, except that the Japanese version is manually operated in both traverse and elevation. A Browning-type 12.7-mm machine gun is mounted on the inner side of a rotatable annular turret ring. For firing, the gunner stands at the side and aims by means of a reflector sight very similar to but smaller than the German "Revi." An emergency ring-and-bead sight is also fitted. Elevation and depression are effected by a hand crank, at the end of which is the firing button. Estimated maximum depression is 30° and elevation 80°, with an all-around traverse.

The lateral guns are two 7.7-mm Lewis-type machine guns. The one on the port side is mounted on a bracket and can be swung across an opening which also serves as a door to the fuselage. The starboard gun, in a cylindrical socket mounting in the middle of the bottom side, traverses a smaller aperture directly opposite.

The ventral gun, a 7.7-mm machine gun for rear use only, is fired through a hole formed by opening two doors in the bottom of the fuselage. Both doors have footsteps in the center, the forward half of each having a perspex window with two protection bars. There are two similar windows on each side of the fuselage, permitting a view to port and starboard. Forward of these are three perspex panels half-way up the fuselage side. A red push button on the starboard side of the fuselage floor near the gun is presumably connected up to some warning device (horn?) in the pilot's cockpit.

A 7.7-mm Vickers-type machine gun is mounted in the tail on a free-traversing bracket, the elevation and depression of which is controlled by another bracket attached to the forward end of the gun barrel. Both brackets are connected by link mechanisms to rods running down both sides of the fuselage. These, in turn, are coupled to a curved arm carrying a pistol grip which is operated by the gunner standing in the turret. Coupled in the linkage is a ring-and-bead sight,

which protrudes through two holes in the turret, and movement of the pistol grip controls the gun and the sight. The maximum movement appears to be 10 degrees in any direction, giving a cone of fire with a 20-degree angle. On the control arm are two "T" handles connected by Bowden cable to the cocking handle and to the stoppage clearing handle, respectively. The gun is fired by a trigger mechanism in the arm, connected by Bowden cable to the front sear on the gun.

The bomb bay in this new bomber, measuring approximately 15 ft. by 3 ft. and being 18 in. deep, is believed to carry a maximum load of 2,500 to 3,000 pounds. This load is an improvement on that of any known Japanese bomber. The bombs appear to be mounted alternately, nose-to-tail.

Five fuel and two oil tanks were traced. The oil tanks were in the leading edge, and the name plate gave a capacity of about 38 U.S. gals. Both of these latter tanks had self-sealing coverings which formed the actual outside skin of the wing. Two fuel tanks are situated in each wing root, and a third in the fuselage over the bomb bay. The total capacity is about 687 gals.

When carrying a load of 1,100 pounds, it is estimated that the airplane has a maximum speed of 285 mph at 13,000 feet, a service ceiling (with normal load) of 30,000 feet, and a cruising range of 950 miles. With 2,750 pounds of bombs the economical range is 1,300 miles.

ANTIAIRCRAFT

3. GERMAN ANTIAIRCRAFT CEILINGS

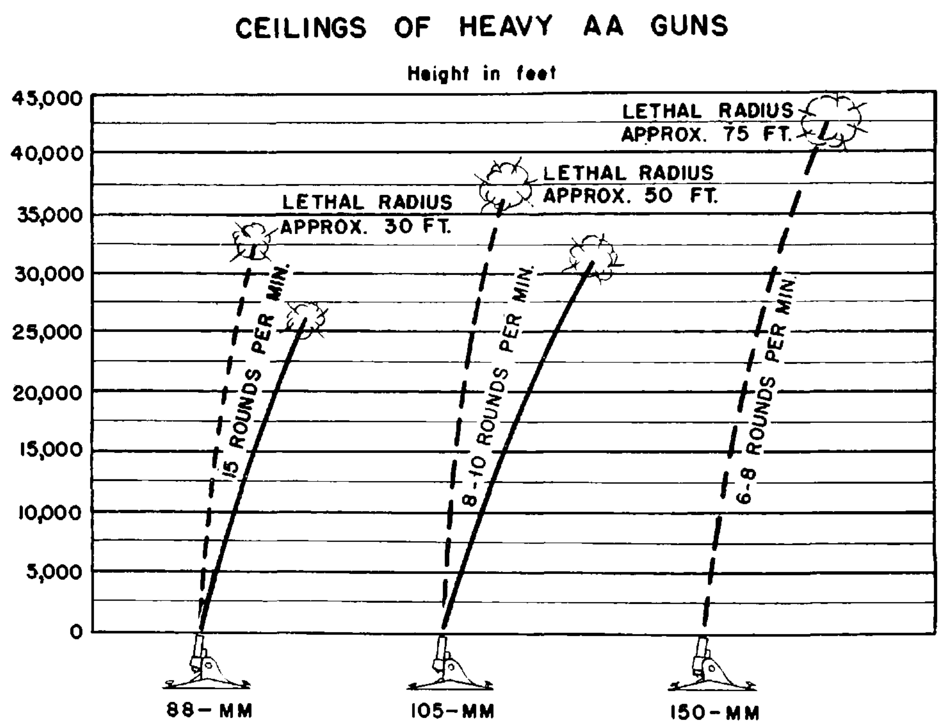
In order to assist in estimating the chances of being successfully engaged by antiaircraft fire when operating over enemy territory, three diagrams are here shown. They illustrate the ceilings of light and heavy antiaircraft guns and the zones of engagement of heavy antiaircraft guns.

a. Ceilings of Heavy AA Guns

The chance of being hit at the maximum ceiling (shown in figure 1 by broken-line trajectories), although it cannot be ruled out, is extremely small owing to the very long time of flight of the projectile and the fact that only one round can reach these heights while the plane is within range.

Prolonged engagements of a plane or formation are possible only at lower heights. The effective ceiling (shown in figure 1 by solid lines) for the 88-mm and 105-mm guns represents the maximum height at which a directly approaching aircraft flying at 300 mph can be engaged for 20 seconds with the last round fired at a quadrant elevation of 70 degrees. It will be seen that the resultant effective ceiling for the 88-mm gun, for example, is 26,250 feet. The accuracy of this basis of calculation is borne out by recently received evidence which suggests that the "88" does in fact have great difficulty in effectively engaging targets flying at about 26,000 feet.

Fire at the effective ceiling is apt to be only relatively accurate, although a number of reports have come in of accurate barrage fire at considerable heights. In these cases, however, formations had flown a constant course and height for unduly long periods, and this allowed ample time for the preparation of firing data. Aside from special situations of this kind, the most effective heights for fire by heavy guns on targets in sight are between 4,000 and 10,000 feet for individual



---- Trajectory to ceiling at quadrant elevation of 85°.

——— Trajectory to effective ceiling--calculation based on 20 second engagement of directly appraoching aircraft flying at 300 mph, last round being fired at quadrant elevation of 70°.

FIG. I

aircraft, and between 4,000 and 14,000 feet against formations. For unseen targets, the most effective height is from 6,000 to 12,000 feet.

The lethal radii of burst noted in figure 1 are necessarily approximate. It should be remembered that the major effect of a burst is forward, so that danger from a close burst above an airplane is considerably less than from a burst in any other position.

b. Ceilings of Light AA Guns

Figure 2 is largely self-explanatory.* The sights used with light AA guns are chiefly of value for obtaining accurate opening fire. Subsequently, corrections are generally made by observation of tracer. This fact, together with the falling away of the trajectory above certain heights, mainly accounts for the distinction between heights to which accurate engagement is considered likely and heights at

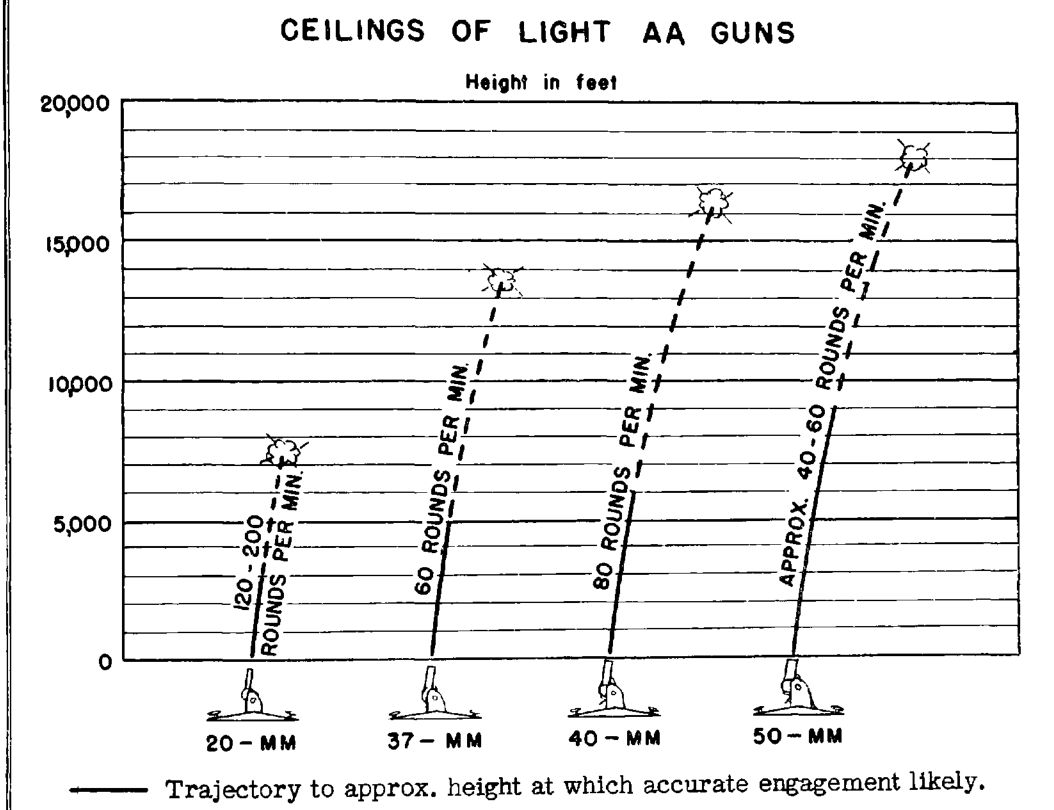


FIG. 2

which self-destruction takes place. It will be obvious that this distinction shown by the change from solid to dotted trajectories in figure 2 is very approximate.

*It should be noted that the rate of fire indicated in figure 2 for the 20-mm gun has reference to the single-barreled gun; the four-barreled 20-mm AA gun fires about 700 to 800 rounds per minute.

c. Zones of Engagement of 88- and 105-mm Guns

Figure 3 is a diagram designed as a guide for estimating how closely aircraft flying at various heights can approach a gun position without being engaged. This diagram shows the maximum ranges and dead zones of 88-mm (solid line) and 105-mm (broken line) antiaircraft guns from which can be read off maximum zones of engagement. These zones apply to directly approaching targets. For any other target course, zones of engagement will be smaller. The 150-mm gun (not included owing to insufficient data) is known to have better performance, and some additional allowance should therefore be made for this weapon.

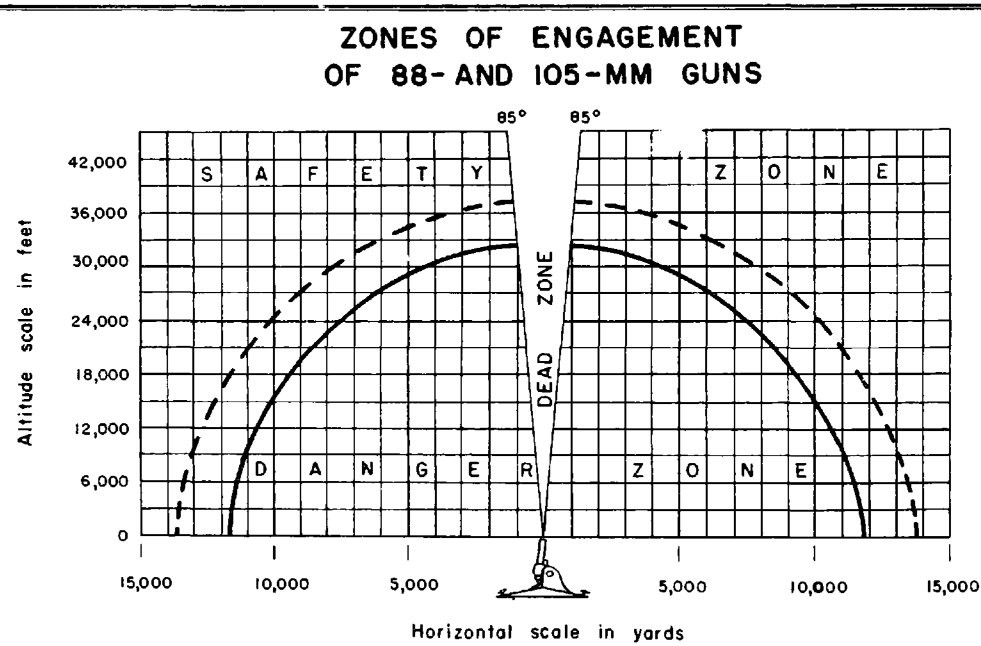


FIG. 3

The 88-mm and 105-mm guns constitute the main German heavy antiaircraft equipment. The existence of a 150-mm AA gun is supported by only scanty evidence. The 128-mm AA gun is believed to be in use and to have a ceiling of from 35,000 to 40,000 feet.

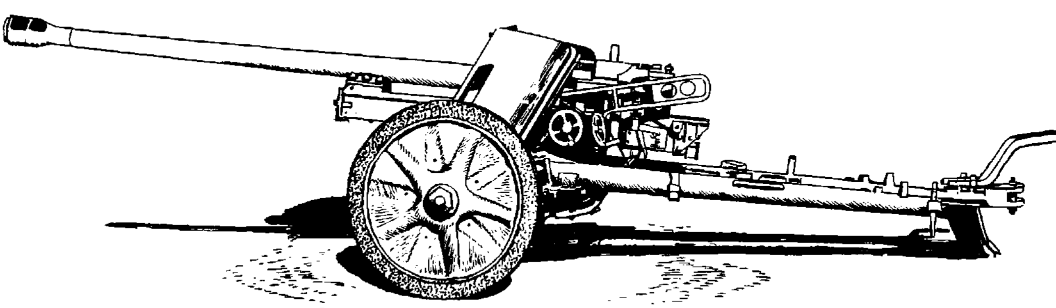
ANTITANK

4. GERMAN 75-MM ANTITANK GUN--7.5-CM PAK 40

Mention of this gun has already been made in Tactical and Technical Trends (No. 18, p. 4). It must not be confused with the 7.5-cm Pak 97/38 which is a German modification of the well-known French 75 (see Tactical and Technical Trends, No. 22, p. 6).

The 7.5-cm Pak 40 is very similar in appearance to the standard German 50-mm antitank gun, the 5-cm Pak 38. However, the following structural differences may be readily noted:

Item	5-cm Pak 38	7.5 cm-Pak 40
Shield	Curved. Flattened at outer edges	Angular. Flat frontal section with two flat side pieces set at an angle of approx. 45° to the plane of the frontal section
Muzzle brake	Narrow and elongated	Broad and longer
Sighting aperture	Rectangular	Square



5-CM PAK 38

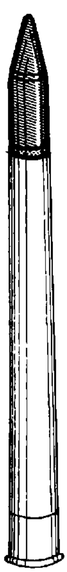
The gun proper, i.e., exclusive of the carriage, is essentially the same weapon as the 7.5-cm Kw.K 40*, which is the principal armament of the new German medium tank, the PzKw 4. Two self-propelled versions of the 7.5-cm Kw. K 40 have also been reported, one mounted on the chassis of a PzKw 2, the other on the chassis of the PzKw 38 (t)**. The chief differences between the 75-mm antitank gun and tank gun are probably the substitution of mechanical firing and percussion primer for electric firing and primer; the chamber of the antitank gun is also probably considerably longer. The breechblock is the semi-automatic, horizontally sliding type.

*Kampfwagon Kanone--used by Germans to designate tank guns.
**A Czech light tank.

The piece is mounted on a split-trail carriage, with torsion springing; this springing is automatically cut out when the trails are opened. The wheels are of a light alloy and are fitted with solid rubber tires. An interesting feature is a detachable third wheel which can be fitted on near the trail spades, thereby permitting the gun to be man-handled more easily. The shield is of the spaced-armor type like the Pak 38; note also that a protective apron is provided.

Further details on this weapon are as follows:

Over-all length in travelling position	19 ft 2 in
Weight in action	3,350 lbs
Length of barrel	10 ft 6 in
Length of recoil	35.43 in
Elevation	22 degrees
Depression	5 degrees
Traverse	65 degrees



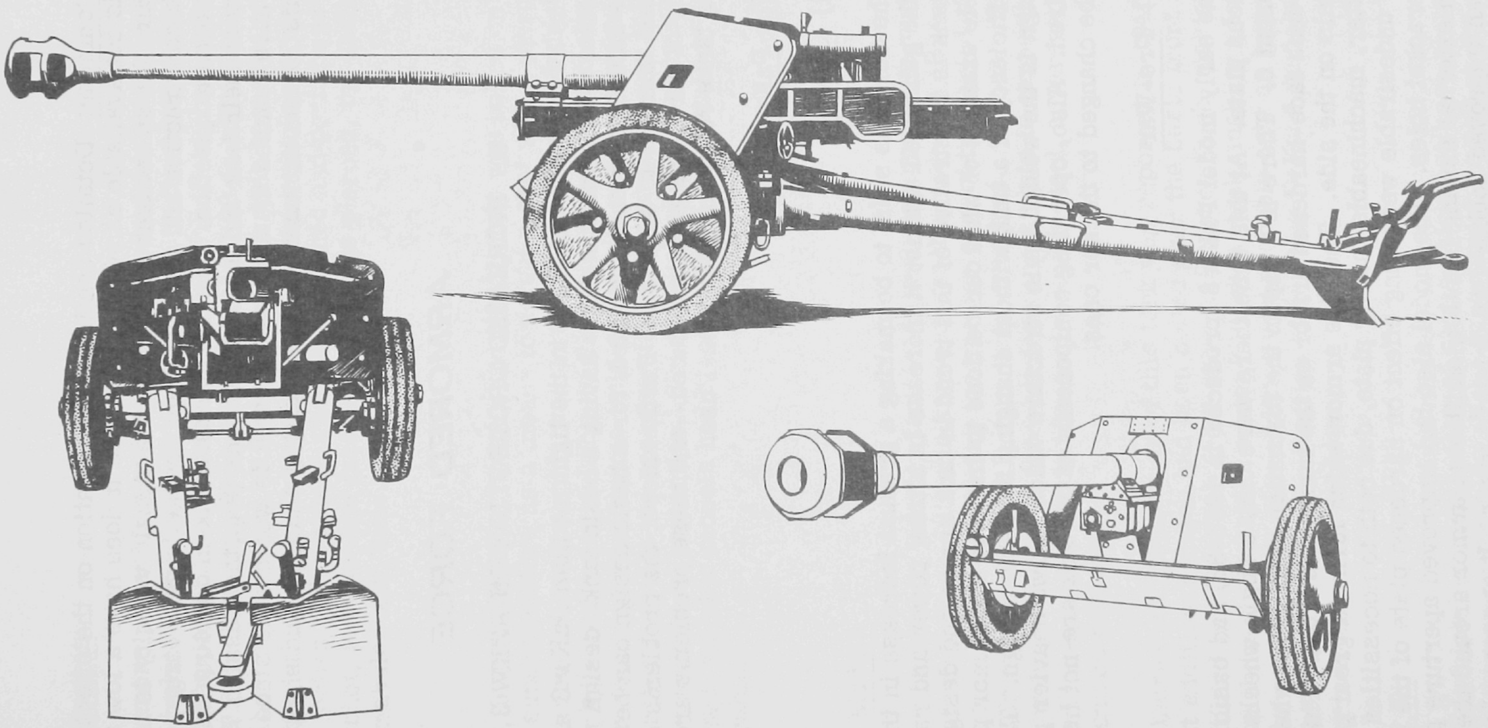
Four types of ammunition are used namely HE, hollow charge, AP shot, and an armor-piercing tracer shell with a small explosive charge and an armor-piercing cap covered with a ballistic nose. Details on this latter type of ammunition (see sketch at left) are these:

Weight of complete round	27 lbs
Length of complete round	36.14 in
Weight of projectile	15 lbs
Weight of HE filling	3/4 oz
Weight of propellant	6 lb 3/4 oz
Muzzle velocity (estimated)	2,830 f/s

With this AP-HE ammunition it has been estimated that this gun can penetrate homogeneous armor as follows:

Range	Normal	30 degrees
500	5.20 in	4.43 in
1,000	4.72 in	4.02 in
1,500	4.27 in	3.62 in
2,000	3.82 in	3.23 in
2,500	3.43 in	2.87 in

The AP shot is the usual German steel casing enclosing a tungsten carbide core; it is fitted with tracer. The muzzle velocity with this ammunition is reported to be 3,250 feet per second.



7.5-CM PAK 40

Comment: Detailed confirmed information on the effectiveness of this weapon is not available as yet. For its size it does have a low silhouette, a desir able feature for an antitank gun. While the muzzle velocity is high, the tube is of monobloc construction and the propellant charge is very large, so that the safety factor is open to question. The Germans have been doubling the length of the chambers in their tank and antitank weapons (e.g., the Russian 76.2-mm gun), and seem to have reached the conclusion that it is worthwhile since they are now producing this 75-mm antitank gun with the long chamber and shell case as a standard weapon.

ARMORED FORCE

5. INCREASED PROTECTION ON PZKW 3 AND 4

The history of the changes in the light medium PzKw 3 and 4 demonstrates how fortunate the Germans were in having a basic tank design that could be improved as battle experience indicated, for a basic design can be improved and still remain familiar to the users. Furthermore, the problems of maintenance and supply of parts are greatly reduced--and these problems are a major factor in keeping tanks ready for operational use.

a. The PzKw 3

(1) General

The Germans seem to be making a gradual increase in thickness of armorplate as the guns used against it increase in hitting power and range. The PzKw 3 medium tank is illustrative of this trend in tank armor and design, and affords a remarkable example of what can be done to improve the armor protection and fighting efficiency of a tank without changing its basic design. The key of this basic design is the welded main structure which allows heavier plates to be used when desired. Also, operating components of the tank are not hung on the plates likely to be changed to thicker ones.

(2) Pre-War

The early model PzKw 3 (produced in 1936-38) had basic armor of .59-inch homogeneous plate. At this time there were only 5 bogie wheels on a side instead of the present 6. There is a gap in the formation until 1939, when the tank appeared with 1.18-inch face-hardened armor on the turret and front. This model had 6 bogie wheels on the side. The side armor which forms a great part of the chassis was of softer, machineable-quality plate, due both to necessities of manufacture and to the undesirable weakening effect on hardened plate of the necessary suspension and bracket holes. The model also had improved aperture protection in the form of an external moving mantlet, additional armor around the machine-gun port, and an improved double-flap driver's visor. It appears that these features were added with the modification of but 2 plates on the tank.

(3) 1941 Changes

In 1941, as more powerful guns were being used against tanks, 1.20 inches of additional armor plate was bolted against the plates on the front of the superstructure and on the upper and lower nose-plates. The 1.18-in. basic plates were face-hardened to a Brinell hardness of 600 to 800 and 1.20-in additional plates were the same. About a year later, in January 1942, the tank appeared with a basic armor of 1.96 inches on the front and back, the side-armor thickness remaining unchanged at 1.20 inches. This armor was face-hardened and performed well against monobloc shot, but once the face-hardening was pierced, the shell fragments penetrated the remainder with ease.

(4) 1942

Therefore, in June 1942, a .79-inch additional plate was bolted on the gun mantlet and front superstructure as a means to defeat a shot with a piercing cap. Between this plate and the basic armor was an air gap or space, varying from 4 to 8 inches. The plate conformed roughly to the shape of the section covered. The spaced armor seems to have been a field expedient, resulting undoubtedly from the demonstrated fact that the spare section of track carried on the front of German tanks gave additional protection. This method of adding armor was officially recognized, as later models had brackets fitted for installing spaced armor when desirable.

b. PzKw 4

(1) Early Models

The PzKw 4, a slightly heavier tank than the 3, has passed through much the same line of development. Little is known about the models A, B, and C of this tank, but Model D was in use during the greater part of the period 1940-43. Specimens of armor cut from Model D have been examined. Of these, only the front plate of the hull appears to be face-hardened; this plate is carburized. All of the plates were high-quality, chromium-molybdenum steel, apparently made by the electric-furnace process.

The first increase in the armor of this tank was reported in 1941, when it was observed that additional plates had been bolted over the basic front and side armor. The additional plates on the front were 1.18 inches thick, making a total of 2.36 inches, and those on the sides were .79 inches thick, making a total of 1.57 inches. In its early stages, this addition was probably only an improvised measure for increasing the armor protection of existing PzKw 4 models in which the thickest armor was only 1.18 inches.

(2) Model E

In Model E, which had 1.96 inches of single-thickness nose plate, the fitting of additional armor on the front of the superstructure and on the sides of the fighting compartment was continued. Although the arrangement of the additional

side armor on this model appears to have been standardized, that on the front superstructure was by no means uniform.

Three PzKw 4 tanks have recently been examined. In each case, extra armor had been fitted to the vertical front plate carrying the hull machine gun and driver's visor. It had also been added to the sides of the fighting compartment both above and below the track level. The extra protection above the track level extended from the front vertical plate to the end of the engine-compartment bulkhead. It was thus 110 inches long and 15 inches deep. The pieces below the track level were shaped in such a way as to clear the suspension brackets. They were 90 inches long and 30 inches deep. All this extra side protection was .97 inch in thickness.

The vertical front plate was reinforced in three different ways. On one tank, two plates were used; one over the plate carrying the hull machine gun, this additional plate being cut away to suit the gun mounting, and the other plate over the driver's front plate, cut to shape to clear his visor. On the second tank, the arrangement around the hull gun was the same, but the extra protection around the driver's visor consisted of two rectangular plates, one on each side of the visor, there being no extra plate immediately above the visor. On the third tank, the only additional front armor was the plate around the hull machine gun. No additions had been made to the driver's front plate. In all cases, the extra frontal plating was 1.18 inches thick; the nose plate was unreinforced, but it was 1.97 inches thick, and the glacis plate was .97 inch thick. The final drive casings of PzKw 4 tanks of this period were also sometimes reinforced by .79-inch protecting rings. The additional plates on the front were face-hardened.

It is probable that the reinforced armor on the front superstructure of this model will compare closely with that on the corresponding parts of the PzKw 3 of 1941 and that the 1.96-inch nose plates will not differ substantially from those on the more recent PzKw 3's of June 1942, known as "Model J."

The reinforced (.79 inch plus .79 inch) side armor has, however, no counterpart in any PzKw 3 model. The additional plates are of homogeneous quality and have a Brinell hardness of about 370 on the front surface.

(3) Model F

Towards the end of 1941 the Germans introduced a PzKw 4, Model F, having 1.96-inch frontal armor (gun mantlet, front superstructure and hull nose-plates) and 1.18-inch side armor. In this and many other respects, the Model F conforms more closely than its predecessors to the corresponding model of the PzKw 3 (in this case PzKw 3 Model J). So far, the armor of the PzKw 4 Model F has not been examined to ascertain its chemical and ballistic properties, but there is a strong probability that these do not differ greatly from those of the PzKw 3, Model J.

(4) Model G

This model which mounts the long 75-mm gun, Kw.K 40, was first encoun-

tered in June 1942. It is reported from the Middle East that its armor is the same as that of Model F; namely 1.96 inches on the front, and 30 mm (1.18 inches) on the sides.

6. PROTECTION OF JAP TANKS AGAINST STICKY GRENADES

Two Japanese tanks captured in the Solomon Islands were coated all over with grease, apparently to prevent sticky grenades from adhering.

CHEMICAL WARFARE

7. GERMAN ANTIGAS EQUIPMENT FOR HORSES

The horse still plays an important part in the German Army. For example, there are over 4,000 horses in the German infantry division.

German antigas equipment for horses is reported to include the following:

(1) A gas mask with 2 canisters. The mask protects horses and mules against all gases affecting the respiratory organs. The life of the canisters is several hours, depending upon the concentration of the gas and the nature of the animal's work; the canisters can be readily changed;

(2) A pair of goggles to be worn with the gas mask to protect the eyes from spray;

(3) A set of hoof covers to protect the lower part of the leg on contaminated ground. The front-leg covers are shorter than the hind ones;

(4) A supply of decontamination material.

All of the above items are carried in a single special container.

ENGINEERS

8. CAMOUFLAGE

A recent British publication gives some excellent pointers on camouflage, including some principles of general application.

* * *

a. If an effective camouflage idea interferes with an administrative lay-out, change the administrative lay-out.

b. If a camouflage idea prevents the effective tactical use of a weapon or a position, modify the camouflage idea.

c. Remember that camouflage is something to be done before and not after. It should be preventive medicine and not plastic surgery.

d. Therefore, an advance party is worth its weight in gold in planning measures for concealment. In preparing to take up a position, here is the ideal order of events:

(1) Reconnoiter the site and decide how best you may use any existing pattern to assist concealment.

(2) Plan the paths by which you will reach those positions without leaving "pointers" for the enemy to follow.

(3) Plan how to reduce to a minimum the mess due to digging, building, etc., and how to hide whatever part is inevitable.

(4) Hide or disguise the shadows. Cover the shiny surfaces. Make color match the surroundings as well as you can; but remember that it is more important to have the correct texture than the correct color.

(5) See that your camouflage plan is understood and followed by all in the unit.

(6) Remember that unless you keep strict traffic control and maintain your camouflage properly, your position will soon become conspicuous again.

e. Remember that the lower the object, the smaller the shadow cast.

f. Remember that even if you are halted for only a very short time, it is worth while taking all possible measures for concealment. Once spotted by the enemy, even if you are not attacked, your game has been given away.

Even if it is only a matter of parking vehicles for a few hours, it is well worth while sending someone ahead who has studied the principles of concealment.

to view the ground you intend to use and to make a plan of how to use it to the best advantage.

If you can follow the principles outlined above, the positions you occupy will look less like ground taken over by the army. They will therefore look less important to the enemy, less worth while to photograph, or attack. Finally, remember that concealment is not hiding for the sake of hiding. It is hiding in order to attack the enemy with more deadly effect. That is the beginning and end of camouflage of armies in the field.

9. GERMAN WARNING DEVICES IN LIBYA

A United Nations patrol operating in Libya returned with the following information.

An enemy post was surrounded by triple concertina fence, upon which were booby traps that gave warning of the approach of the patrol. Few details are available but it appears that the explosions caused by these traps were not very large. It has been suggested that the traps may have consisted of German "egg" grenades with the screw caps removed and the igniter strings tied to the wire fence.

This type of booby trap had been found before, when a derelict vehicle had at least 20 such grenades tied to it.

For such a device to function satisfactorily, it would be essential for the body of the grenade to be secured firmly. The standard igniter for the grenade has a delay of about 4 to 5 seconds. The effect of the "egg" grenade is mainly blast.

10. GERMAN WOODEN ANTITANK MINES

Recent reports indicate that the Germans have placed orders in Norway for the production of wooden casings for antitank mines. One report states that these casings are of "fiber wood pulp" and adds that their object is to defeat present electro-magnetic methods of mine detection. A second, more detailed report states that the casings measure 8 x 8 x 2 inches and are made of 3/8-inch board impregnated on the inside. The filling is stated to be "trinol" (TNT), and the igniter, which is of the pressure type, is described as contained in a zinc casing, and inserted into a pressed TNT booster. The report states that on one occasion, owing to a shortage of TNT, the mines were filled with "donarite" (a commercial explosive of the dynamite class), but that this practice was abandoned as soon as supplies of TNT were received. It is further stated that the mines are specially intended for use in coast defenses.

Two types of wooden-box antitank mines have been encountered recently in North Africa. The first is a wooden box (Italian) 12 in. square and 6 in. deep, containing 25 blocks of TNT amounting to 11 pounds,* with 4 igniters of thin bakelite. Approximately 180 pounds of pressure on the wooden lid is needed to trip the igniter. The other kind of box is similar, but not so large, and has two aluminum igniters. One of the recent minefields had 222 wooden-box mines as against 75 Tellermines.

Comment: The Germans may be considering the adoption of non-metallic mine cases and the production of pilot models for trials is probably true. The use of such mine cases would reduce the detecting range of mine detectors.

11. ITALIAN ANTIPERSONNEL MINE

The following information on a new Italian antipersonnel mine has been obtained from the examination of captured specimens.

The mine proper consists of a thin sheet-metal case 1/16 inch thick (1), on the outside of which is wound the strip-metal loading (2).** This latter consists of 23-1/2 turns of mild steel strip, 0.21 inch in width and 0.15 inch thick. The mine cases and the reported production of pilot models for trials is probably true. The use of such mine cases would reduce the detecting range of mine detectors. of TNT weighing 100 grams (3.5 ounces). The over-all length (with striker cocked) is 17.6 inches.

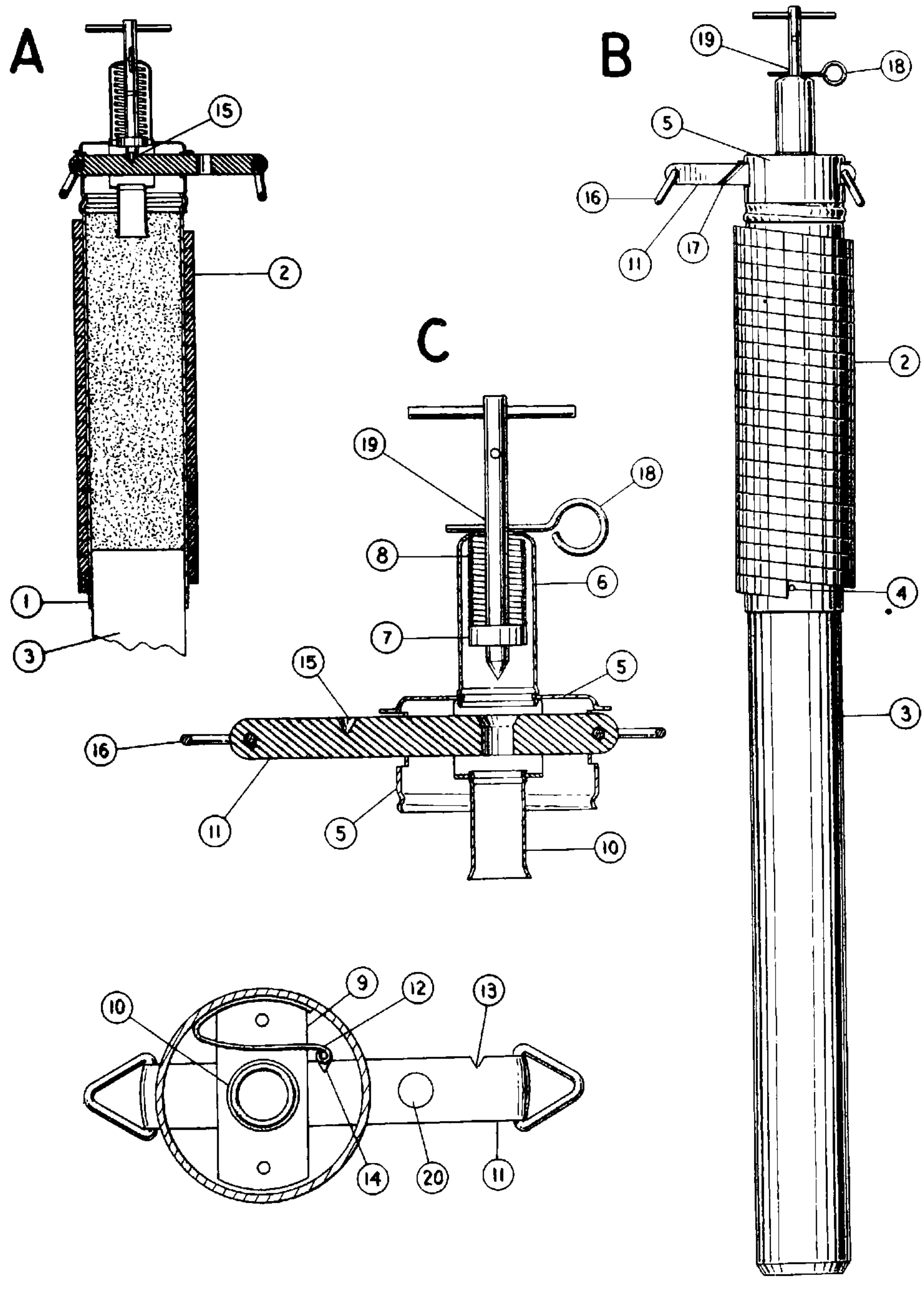
The mine is closed by the screw-on lid (5). Into a hole in the top of the lid is inserted the housing (6), which contains the striker (7) and the striker spring (8). Riveted to the under side of the lid is the stirrup-shaped holder (9), into the center of which is pressed the tube (10) which houses the detonator. Passing through the lid, through slots in the side, is the aluminum cap holder (11), which is located in the armed and unarmed positions by the spring (12). The coiled end of the spring engages in the groove (13) in the firing position, and in the groove (14) in the unarmed position. Uncocked, the striker rests in a seat (15).

The loops (16) at the ends of the cap holder enable the latter to be pulled into the firing position by remote control, and at the same time prevent the holder from being pulled out completely. The groove (17) is probably intended to weaken the holder, though its use is not apparent.

The mine is armed by pulling out the striker, against the action of the striker spring, from the position at A (see sketch) to the position shown at B, and inserting the safety pin (18) in the lower hole (19). The striker is then cocked. The cap is next inserted into the hole (20), and the trip wire connected up to the safety pin (18). Finally, the cap is pulled into the firing position shown at C, and the mine is then completely armed.

*There is reason to suppose that this weight may be even more--possibly 25 to 30 pounds.

**This is apparently grooved to assist in fragmentation.



ITALIAN ANTIPERSONNEL MINE

INFANTRY

12. SOME NOTES ON GERMAN EXPERIENCES IN RUSSIA

The Germans have not failed to draw appropriate lessons from their campaign experiences in Russia. These have sometimes resulted in the re-emphasis of old doctrines; at other times, new or modified tactics have been adopted to meet particular features of warfare on the Eastern Front. Some of the combat lessons as stated in German documents are summarized below.

* * *

a. Attack

The practicing of attack tasks by individual companies, with heavy weapons and an allotment of engineers and assault guns, is very important. Instruction in close combat is to be extended. The importance of coordinating flat-trajectory and high-angle fire must be drilled into all officers, from section leaders up.

The success of attacks lies in using darkness and bad visibility to allow one's forces to approach the enemy and prepare for the breakthrough.

Attacks should not always be made at the same time of day, but, like the Russian practice, often at night, at dawn, in fog, or in snow storms.

Concentration of fire must be obtained by the allotment of heavy weapons to companies in the assault. The urge to speed up the attack must not lead to insufficient preparation.

When a position is taken at dusk, all-around defense must be effected (hedgehog fashion), and improvements made as soon as it is light.

b. Fire

The best riflemen should be equipped with automatic rifles with telescopic sights, so that they can be used as snipers with best effect. Rocket weapons are to be used when practicable, as they have a great effect against attacking forces and those which have dug themselves in. Heavy infantry-gun shells with delay fuzes often fail to explode on hard objects such as stony ground, stone walls, houses, ice, etc., as the fuzes break off. When this is noticed, an immediate change-over to instantaneous fuzes must be made.

c. Defense

The Russians are keen observers. All lights, smoke, etc., must be cut down to a minimum. At night, listening posts manned by two men must be set up and great stress laid on the importance of sentry duty. This must be practiced for long periods at night and in all weather.

d. Town and Street Fighting

When a village is attacked, the enemy must be held down frontally and attacked from the sides and rear. Strong assault units, armed with plenty of grenades, should take the individual houses and nests. Large built-up areas must be attacked systematically, section by section.

The defense of villages must combine aggressive reconnaissance of the front and flanks with the neutralization by fire of known assembly points. The Russians are adept at utilizing all available cover in order to approach villages from the flanks. They aim at taking up enveloping positions in order to launch an attack, often at night, for the systematic destruction of the village. If tanks are used, they engage house after house with their guns and force out the defenders.

e. Miscellaneous

(1) On repeated occasions, high casualties have been produced by bunching, and by failure to move forward by short bounds. (Over-fatigue and resultant indifference were given as reasons.)

(2) In order to lessen the number of abdominal and chest wounds, strict instruction must be given in short and skillful movement by bounds.

(3) It is most important that men dig in quickly and effectively to protect against surprise fire from mortars and rocket guns. Every soldier must be reminded that digging in and camouflage are his duty at all times. As soon as troops are within enemy artillery range, slit trenches should be prepared (without special orders).

(4) Personnel of first-line transport should be instructed in the building of cover for men, horses, and vehicles. All areas behind this front should be on the alert for raids.

13. GERMAN COMBAT INSTRUCTIONS

It is believed that the following combat instructions, a translation of German Panzer army headquarters' order, will be of general interest. The order has reference to recent operations in Tunisia. It is reproduced with only a few minor changes made with a view toward greater clarity for American readers.

* * *

a. Organization of Defensive Positions

Having increased to the full the bridgehead, this defensive position must be organized and strengthened until the arrival of the main force.

(1) Work will be done in the following order:

(a) Road blocks (with mines, according to circumstances)
(b) Siting of antitank guns and machine guns
(c) Assembly points for tanks
(d) Command posts
(e) Telephone communications

(2) Since engineering equipment and transport have not arrived, work must be done temporarily with improvised or rented material (no requisitioning).

b. Reconnaissance

War in Africa necessitates a far more extensive reconnaissance than in Europe. For this reason, reconnaissance patrols in certain cases are away for several days.

(1) First, the Axis forces must push out reconnaissance forces to a line 20 kilometers west of Kebili.*

(2) To achieve this, even by using Arabs, it is necessary to know to what nations and to which arms of the service the enemy forces behind this line belong--a line which is considered to be the advance line of the main body of their army.

(3) Use must be made of assault troops. Based on preliminary close reconnaissance, attacks must be carried out to cut off isolated enemy elements and capture transport (especially motor transport) and arms.

(4) Any plan of action for a unit larger than a company must first be communicated to Army Hq.

(5) Actions of a particular nature which aim at the capture of necessary avenues of approach, of high ground suitable for observation, etc., must be communicated in reasonable time so that the support of Army reserves may be given to units near the battle area.

c. Tactics

Every effort should be directed towards defense against much superior infantry, armored forces, and air attack which might threaten our present line.

(1) Every position must have an element (about one third of the whole strength) armed with numerous automatic weapons and ample ammunition, in order that centers of resistance may be formed, particularly on roads.

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*Kebili is roughly 225 miles south by west of Tunis and about 100 miles south of Kasserine Pass. A north-south line running through Kebile would be about 55 miles west of Tunis.

(2) In rear of the flanks, units must be held ready for counterattack along lateral roads that have been reconnoitered and along which night positions have been prepared. It is not a matter of seeking contact with the enemy's flank but of penetrating into his rear.

(3) Our artillery, still numerically weak, consists of infantry howitzers.* The artillery must organize positions and observation posts not only on one but on all the possible enemy lines of advance, and prepare or improve the quickest route (i.e., the shortest) which may link up these positions. Only extremely mobile artillery can, by its dispositions, fulfill its task.

(4) Besides emplaced antitank guns, unit commanders must have a mobile reserve of antitank weapons.

(5) Fire is nearly always opened at the wrong moment.

(a) Artillery must open fire at extreme range.

(b) Infantry and machine guns only fire at 300 meters. Enemy infantry carried in armored vehicles must be fired on first, thus separating the following infantry from their tanks.

(c) Assault tanks which move in front are not the concern of the infantry. They are neutralized by the antitank defense and by artillery. Enemy tanks which remain in the infantry area must be blinded and destroyed by groups specially trained as tank destroyers.

(d) Regimental antitank weapons must open fire at not more than 500 meters. If fire is opened earlier, it is a sign of fear, and above all it achieves no results. At the opportune moment an attack should be made on the flank; at the same time reconnaissance elements should be pushed forward within the enemy lines to oppose new enemy supporting forces, but the results of this action must not be waited for. The counterattack can be undertaken and be effective when the enemy is completely beaten and brought to a halt by fire. The troops engaged frontally likewise take part in the blow delivered against the enemy.

d. Messages and Information

(1) I forbid the use of the expression "strong enemy force."

(2) Either exact figures, or the extent of an attack (for example 100 meters) will be given, or the forces employed will be specified (For example: "one platoon at least"; "one company at most.")

(3) Care must be taken that all observations be communicated exactly and precisely to higher headquarters. The time, place, and circumstances in which such and such a thing has been observed or attacked by fire must be stated.

*Six 75-mm and two 150-mm infantry howitzers in each infantry regiment.

e. Comfort of Troops (Duties Incumbent on Unit Commanders)

(1) The most advanced posts must have hot soup.

(2) Now, during the rainy season, protection against dampness is extremely important; if necessary, Arab "burnous"* must be bought to prevent sentries getting wet.

(3) Carry a pair of socks in the trouser pockets, so that you can change after completing a tour of guard duty.

(4) Do not allow men who have a touch of temperature to become seriously ill; otherwise, they will be off your strength for several months. Send them in time to the field hospital, for 3 or 4 days.

(5) Everyone must wear continually a flannel body belt.

(6) In future, from sunset to sunrise the body should be fully covered.

f. Supplies

Supplies should be echeloned from the unloading point to units, so that local means of transport may be utilized, and gasoline be saved for operations.

g. Transport

Motor transport of all types must have their documents (e.g., for drivers, the dispatch ticket). General's vehicles are the exception to this rule. Motor transport will be requisitioned to give mobility to units. (Signed: Arnim)

14. JAPANESE USE OF NOISE AS A WEAPON

The following notes are quoted from an Australian publication, and concern Japanese tactics as designed to give their opponents the "jitters--the 'we are cut off"feeling."

*   *   *

When the operations of the present war are examined closely, especially those in Malaya, it is realized that defeats and retreats are brought about principally by the new weapon--"Noise." The more eerie the noise, the more effective--anything that can give troops the "jitters."

Noise is used to upset the morale. It aims at disrupting the psychological balance of the soldier and sometimes affects whole units.

---

*Woolen robe.

Aerial bombing causes few casualties, especially when troops are in shelters or slit trenches, but the effect on the troops is very great--much greater than artillery bombardment where the casualties are much heavier. In Malaya, troops which stood up well to artillery and mortar fire became extremely uneasy under aerial bombing. This was due mainly to the great smashing noise caused by the explosion of bombs. Usually the Japanese "blanketed" an area by dropping bombs from 20 or 30 or even more aircraft simultaneously. The noise was terrific and the effect on the troops in the area was very great psychologically, though not serious physically.

This psychological effect cannot be ignored. Many military leaders--usually those who have not experienced heavy aerial bombing--cannot understand why troops should be so seriously affected when the physical casualties are so light. The fact is that they are affected.

One noise-making device used on many occasions in Malaya by the Japanese was to fire bursts from a machine gun (or even two or three) behind the line all night long. This soon created in the receptive minds of the troops the "we are cut off" idea. Sometimes a few snipers who had infiltrated behind the lines fired shots throughout the night for the same purpose. They fired into space--no casualties from this firing were experienced, but the "casualties" on the morale side were heavy. Weak troops began to worry, and "look over their shoulders." They became unreliable, and when pressed from the front and flanks they were inclined to surrender, or more frequently to "escape." They usually escaped easily enough without loss through this phantom force behind them. The enemy, expecting this, was quick to take advantage of it, and thus another retreat was started. Usually it took days to collect these drifters or stragglers, and when they were collected and sent forward again they were less reliable than ever.

In Malaya and also in the Philippines, the Japanese used a time bomb fired behind our lines by a mortar or gun. On striking the ground, the bomb burst open and set off a fuze which fired intermittent explosives which sounded like a machine gun. This was called by our troops "a packet of crackers." This sounds childish, but it had a definite effect on many troops, especially those whose morale was below the average.

The Germans have an attachment to aerial bombs and shells, a device which makes a screaming noise as they fall through the air.

Any noise that may upset the nerves of their enemy has been adopted by both the Japanese and the Germans.

Our men must be taught to steel their nerves against uncanny and eerie noises. During their training, especially night training, all kinds of weird noises should be used to accustom them to this new weapon. They must be taught that noises hurt no one. They must learn to laugh at them.

At the same time, we should copy this successful trick from our enemy. The Japanese are very susceptible to howling noises. When the Australians

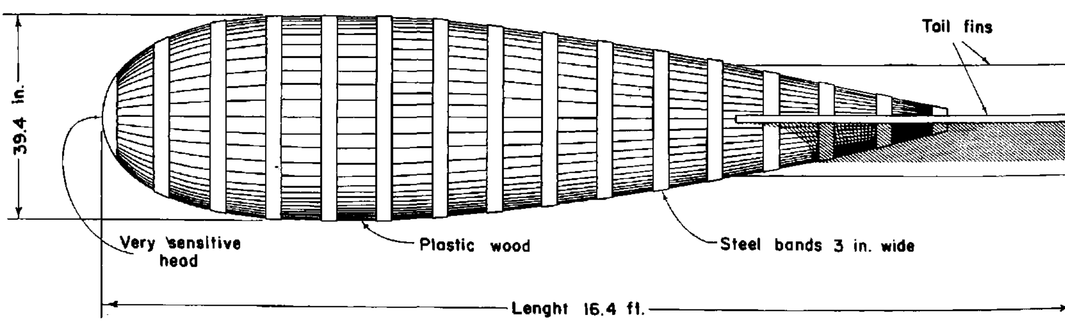
charged them with the bayonet, they went in with a terrifying yell. The Japanese could not stand it--they ran away screaming time after time. The yell terrified them as much as the sight of the cold steel.

We must invent and use every ingenious device that can terrify frightened men. Siren whistles should be used, of course with discretion. Even a soft tapping of wood or metal constantly all night long near their lines will worry them. Animal noises, even eerie lights, will have an effect. The ingenuity of cunning soldiers will soon devise sound effects that will upset the nerves of our enemy. They must be used with caution, otherwise they will become ridiculous--thus eliminating noise as a weapon.

ORDNANCE

15. PLASTIC-WOOD LIQUID-AIR BOMB

From an unofficial German source which may or may not be trustworthy, comes a description of a bomb built up out of staves and hooped like a barrel, with liquid air as a bursting charge.



The material was plastic wood consisting of seven or eight pressed layers with a total thickness of about 60 mm (2.37 in); the steel hoops were about 3 inches wide. In length, the bomb was about 5 meters (16.4 ft); in diameter, about a meter (39.4 in). The weight was not stated. In the dome-shaped head was a sensitive fuze and detonator. The explosive charge was stated to be liquid air.

16. ITALIAN 5-KILOGRAM TARGET-INDICATOR BOMB

The report on this particular type of bomb, known by the Italian name of <u>bomba vento</u>, gives the following dimensions:

Total weight	11.5 lbs (approx)
Over-all length (without fuze)	15.2 in
Over-all length (with fuze)	17.4 in

Length of body	8.9 in
Length of tail	9.2 in
Maximum diameter of body	5.2 in
Diameter of tail	7.0 in

The bomb is formed on a thin, sheet-metal cylinder (1) - see figure A - 6.7 inches in length and with a diameter of 3.1 inches. The lower end is closed by a thin steel disk (2) which has a central hole 0.9 inch in diameter. The fuze tube (3) is fitted over this hole and pressed into the disk (2). The four supports (4) for the vanes are spot-welded to the side of the cylinder. The short tube (5), 1 inch long and threaded at its outer end to receive the suspension lug (6), is also spot-welded to the cylinder (1). (For vertical suspension the lug in the fuze is used.) Four additional short tubes of small diameter are welded over four corresponding holes near the open end of the cylinder. One pair of these short tubes, which are 0.9 inch apart, lies symetrically between two vanes, and the other pair directly opposite between the other pair of vanes. They are intended as guides for the wire*(7) (see figure B). The bomb body (8) consists of hard concrete in which steel pellets are embedded. Two sets of spiral reinforcing are provided. Three turns of wire (approximately 16 standard wire gauge) are wound clear of the cylinder (1) near the open end. The wire passes through holes (9) in its vane-supports (4) and is welded at its end to the cylinder. Five turns of heavier reinforcing (about 8 standard wire gauge) are wound as shown at (10). This wire is welded to the cylinder (1) at one end and to the tube (3) at the other.

The vanes (11) are made of aluminum alloy and are riveted to the supports (14).

The cylinder contains the bomb filling, which may consist of a cardboard tube (12) filled with a smoke composition (13). The cylinder is closed by a cork plug (14, in figure B) held in position by the wire (7). The smoke composition is labelled <u>Luce e Fumo Bianco</u>, which indicates that a flash as well as a white smoke is emitted from the bomb.

An alternative filling which has been found consists of a 1-kilogram incendiary bomb (15, in figure C) with a black-powder charge (16) placed between it and the fuze when assembled in the <u>vento</u> bomb. When so employed, the incendiary bomb has the usual transit plug (21) drilled to take the flash from the charge (16).

An alternative tail has been recovered in which the cork plug (14) is not used to close the bomb, but instead a wooden plug of the shape shown at (16) figure D performs the double function of closing the bomb and supporting the vanes. These latter, shown at (17), are 8.7 by 2.6 in. and made of three-ply wood. They are inserted in slots in the plug (16) and are strengthened by a metal binding (18) and by four level strips (19) running the whole length of the vanes. There are four holes (20) passing through the plug located halfway between each pair of vanes. The plug (16) is attached to the bomb by four nails inserted through the concrete body. The fuze employed in this bomb is type S.

*I.e., to provide a passageway through the concrete body of the bomb for the wire.

From specimens examined it would appear that the concrete bombs, which are fitted with wooden tails, have no fuzing arrangement. In one case, there was no metal cylinder (1) or fuze tube (3). A single suspension lug was cast in the bomb at the nose. It is thought that these may be the Italian practice bomb, Bomba 5E.

It is learned from Italian sources that the vento (wind) bomb is designed to be used in conjunction with the 500-kilogram gas bomb(Bomba 500 0). The purpose of the bomb when dropped is to indicate the force and direction of the wind at ground level. The former is estimated from the angle the smoke makes with the ground, and the latter from the direction of the smoke trail.

During the day, the "smoke" filling is used, while as an alternative at night, the incendiary filling would be effective.

SIGNAL CORPS

17. AXIS SMOKE CODES AND SIGNALS

From a South African source comes a memorandum on Italian smoke signals for communication with aircraft, stated as applicable to Germans troops as well. The main advantages of smoke were given to be:

Safe and easy handling;
With good visibility it can be seen at 2,000 feet;
Produces dense concentrations for at least 30 seconds.

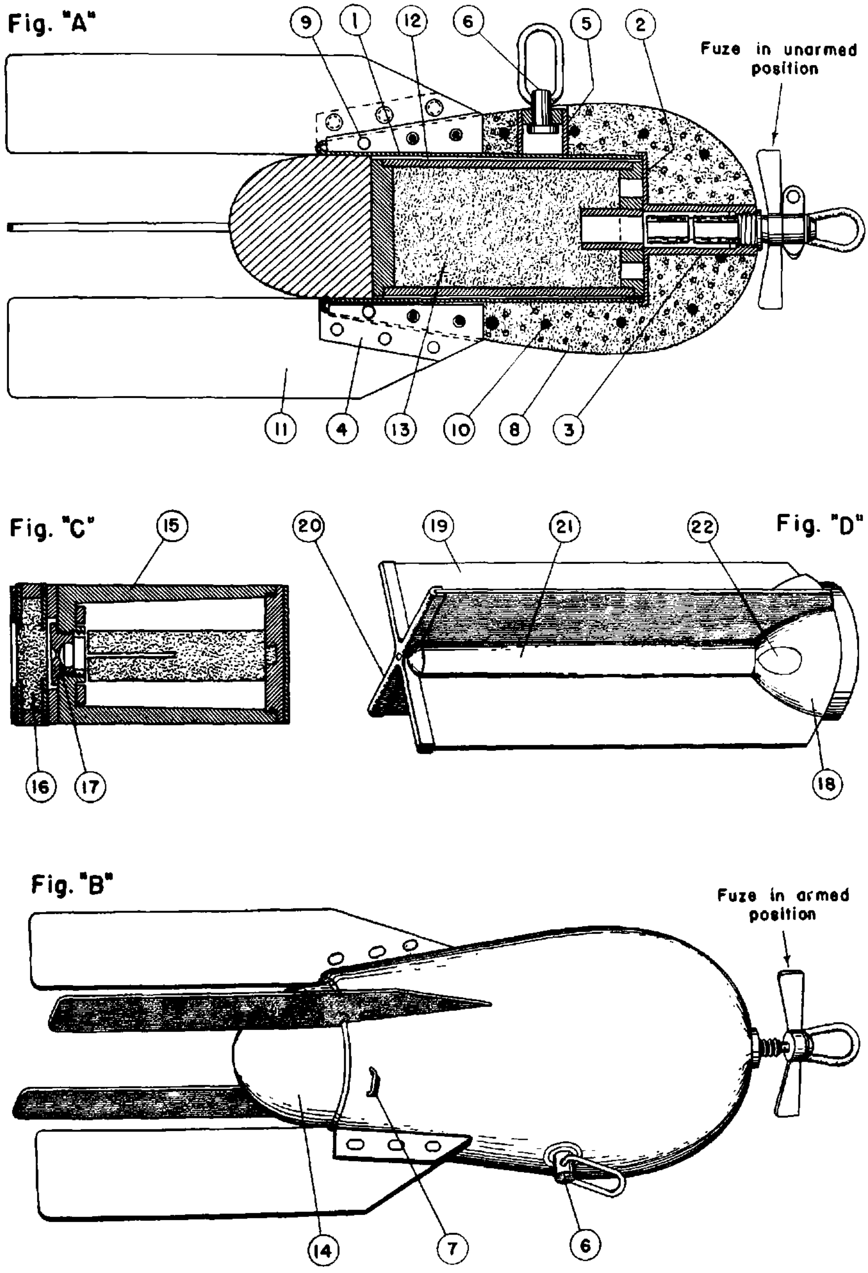
Five basic colors are used; orange, violet, red, green,and white. By using the 5 colors in various pair combinations, a total of 12 distinct and useful signals can be made. These are as follows:

a. Own Troops

Orange	Own troops are here
Orange and red	We are isolated - enemy is behind us
Orange and green	Continue your active support
Green	We are advancing - we are attacking - increase the radius of your action

b. Enemy Troops

Red	Enemy is attacking
Red and green	Enemy attacking our right flank
Red and white	Enemy attacking our left flank



ITALIAN TARGET-INDICATOR BOMB

c. Tanks

Violet	Enemy tanks in front of us
Violet and red	Enemy tanks behind us
Violet and green	Enemy tanks on our right
Violet and white	Enemy tanks on our left
Violet and orange	Own tanks going into action

TRANSPORTATION

18. NOTES ON RUSSIAN AND JAPANESE ANIMAL-DRAWN TRANSPORT

With a high degree of motorization in many modern armies, particularly our own, it is easy to overlook the important part animal-drawn transport has played in World War II. In the German infantry division, horse-drawn vehicles are extensively used. A two-wheeled animal-drawn cart is standard equipment throughout the Japanese army. Finally, it is felt that if Russia had not possessed a large amount of animal-drawn military transport, their supply lines might have long ago broken down with the consequent defeat of her armies in the field; this is true not because of a lack of motor transport, but rather because ground conditions in Russia during much of the year make it essential that motor transport be extensively supplemented by animal transport.

The Soviets have clung tenaciously to the small, time-tested two-wheeled cart and a light four-wheeled wagon for transport, notwithstanding the great strides in motorization. These vehicles are not only used in the army, but also play a very important role in civilian transportation facilities.

There are definite reasons why Russians use a light vehicle instead of a heavy wagon. First, the Russian horse is of small stature, averaging less than 15 hands and, although he is a hardy and tough animal, he is unable to pull the load of the larger draft animal. (It is very unusual to see anywhere in the U.S.S.R. a large horse.) Secondly, inasmuch as so very little hard-surfaced, cobbled, or even improved roads exist in the U.S.S.R., transport is confined to natural dirt roads and even cross country; in certain conditions this make passage all but impossible. For military purposes in particular, cross-country operation is the rule, and in periods of thaw and rain, Russian mud is well-nigh impassable to any type of transport except a small wagon and cart or sled. When a Russian four-wheeled wagon becomes bogged down, a handful of soldiers can extricate it with very little trouble and keep the column moving. Thirdly, the Red Army finds a ready means of supplementing its organic transportation wherever it moves, since every community contains its complement of the standard cart, wagon, or sled which can be quickly commandeered for military purposes.

In the rear areas of the group of Russian armies which surrounded Stalingrad, American observers report the presence of the four-wheeled wagon, and of sleds of the same dimensions and capacities; these were the only means of supply

other than trucks. Where trucking was lacking for the supply during the encirclement of the Germans, thousands of four-wheeled wagons and sleds were recruited from the local inhabitants and elsewhere. The Russian general in command of operations in the Stalingrad area stated that movement from railhead to distributing point was a slow process requiring considerable valuable time, but by utilizing all types of transportation, including the two- and four-wheeled vehicles, he was fully supplied and on time.

The construction of the two-wheeled cart is very simple, and it is built to carry 450 to 500 pounds. It is fitted with shafts and drawn by one horse. It is 2 1/2 ft. deep and 4 ft. long. The four-wheeled wagon and the sled are about 2 feet longer and are drawn by one, two, three, or four horses in line.

It is noteworthy that nowhere is there evidence of the use of large heavy wagons of the escort type.

In winter dogs are used to draw light sleds. In the more northern regions even reindeer are used; they provide the cheapest and most economical means of transport, since they feed on the tundra (open, treeless plain).

In the Japanese Army a two-wheeled cart is standard equipment of the Transport Regiment, and is used throughout the armed forces. The cart is made of wood, and is strongly constructed but light in weight, so that it can be manhandled when necessary. It is fitted with shafts, drawn by one led horse, and carries about 450 to 500 pounds.

When used as an ammunition carrier, the standard load of the Japanese two-wheeled cart is 12 boxes of 540 rounds each of rifle ammunition, or 12 rounds each of 37-mm ammunition. The same cart is also converted into the standard two-wheeled ambulance. In each corner, steel posts are fitted, from which two stretchers are suspended on springs, one above the other. A waterproof canopy with side curtains is fitted. When stretchers are not in use, the cart can accommodate three persons sitting.

SECTION II

ENEMY SELF-PROPELLED GUNS--
A SUMMARY OF KNOWN EQUIPMENT

ENEMY SELF-PROPELLED GUNS -- A SUMMARY OF KNOWN EQUIPMENT

a. General

Self-propelled guns represent one of the technical advances made in ordnance during this war. The following account, from British sources, of German, Italian, and Japanese equipment shows the considerable interest which this development has aroused. Several descriptions and sketches of these guns have already been published in earlier issues of Tactical and Technical Trends.

With reference to German self-propelled guns the following general points are worthy of note:

> There are no known German self-propelled heavy antiaircraft guns;
>
> With regard to antitank guns, while there have been many local improvisations, the present German tendency is to provide self-propelled mounts for the heavier antitank weapons only;
>
> In every case standard guns and standard chassis, whether semi- or full-tracked, are used;
>
> All self-propelled guns are provided with AP and HE ammunition, and can thus effectively engage both "soft" and armored targets.

b. German AA/AT Guns

(1) 20-mm AA/AT Gun

Although primarily an antiaircraft gun, this piece can also be used against tanks. Mounted on a 1-ton half-track (see figure 1) with a gasoline engine, it usually tows a single-axle ammunition trailer. The armament is a long, thin-barreled, 20-mm, high-velocity gun. The weight in action is 4.5 tons; the length, 15 ft. 7 in., the width, 7 ft. 1 in. and the height, 6 ft. 7 in. On roads, the radius of action is about 137 miles; cross country, about 93. The crew is seven men.

There are two versions of the gun itself, namely the 20-mm Flak 30 and the 20-mm Flak 38. The gun, mounted in front, may or may not be shielded. It fires 20-mm, .260-pound, high-explosive shells at a high muzzle velocity of 2,950 f/s, the .327-pound AP shell at 2,625 f/s, and the .223-pound AP 40 shot at 3,270 f/s. The firing rate is 120 rpm. The horizontal range is 5,320 yards. The mount gives an all-around traverse and an elevation varying from minus 12 degrees to plus 90. At 400 yards, the AP shell will pierce .98 inch of homogenous armor at an impact angle of 30 degrees, and 1.50 inches at normal. At 400 yards' range, the AP 40 shot will pierce 1.46 inches at 30 degrees, and 1.69 inches at normal.

(2) 20-mm Four-Barreled AA/AT Gun

This is a Vierling (quadruple) gun on an 8-ton half-track (see Tactical and Technical Trends, No. 4, p. 4) 22 ft. 6 in. long by 7 ft. 11 in. wide and

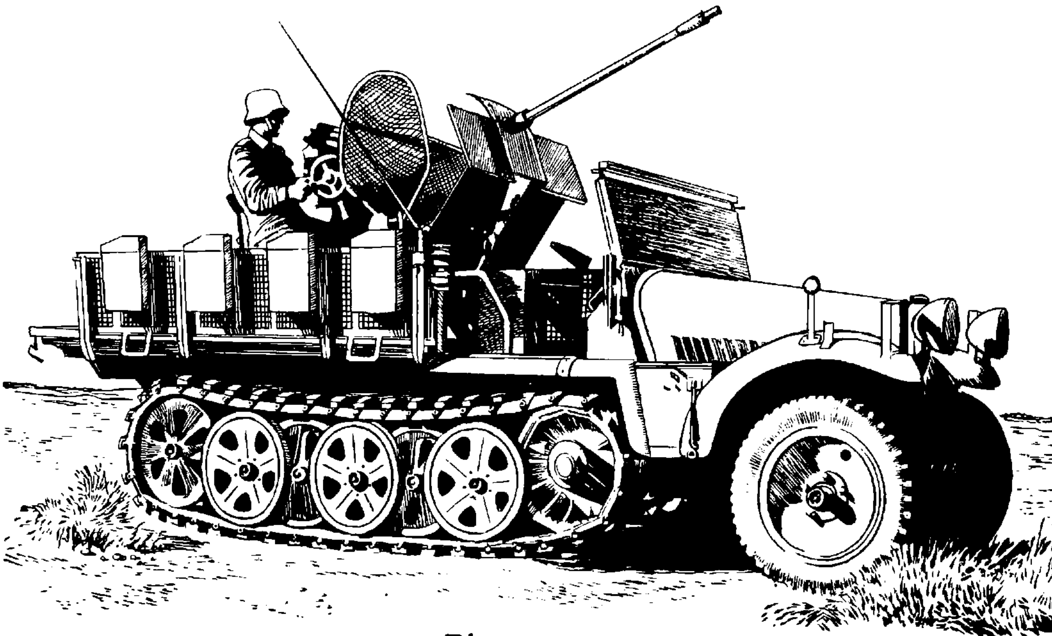


Fig. 1

10 ft. 10 in. high, weighing, ready for action, 11.5 tons. The gasoline engine develops 140 brake horse power, giving a radius of action on the road of 155 miles, and about 62 cross country. The crew is probably eight. The armament is a quadruple 20-mm Flak 38, with an all-around traverse and an elevation stated as from "minus 10 to plus 100" (apparently 10 degrees past vertical--which seems odd, but may be useful when firing at planes passing directly overhead). The range, penetration, and ammunition are substantially the same as for the Flak 30 and 38 previously noted.

(3) 37-mm AA/AT Gun

While like the 20-mm primarily an antiaircraft gun, this 37-mm gun can be used for horizontal fire. It may be identified by the long, slender barrel with a conical muzzle brake (see figure 2), and it usually tows an ammunition trailer. The mount is a 5-ton, half-tracked vehicle, with a 130-HP gasoline motor giving a 156-mile radius on the road, and about 62 miles cross country (which seems rather small). The length and breadth are 20 ft. 7 in. by 7 ft. 6 in.; the height is 9 ft. 2 in. The crew is eight men.

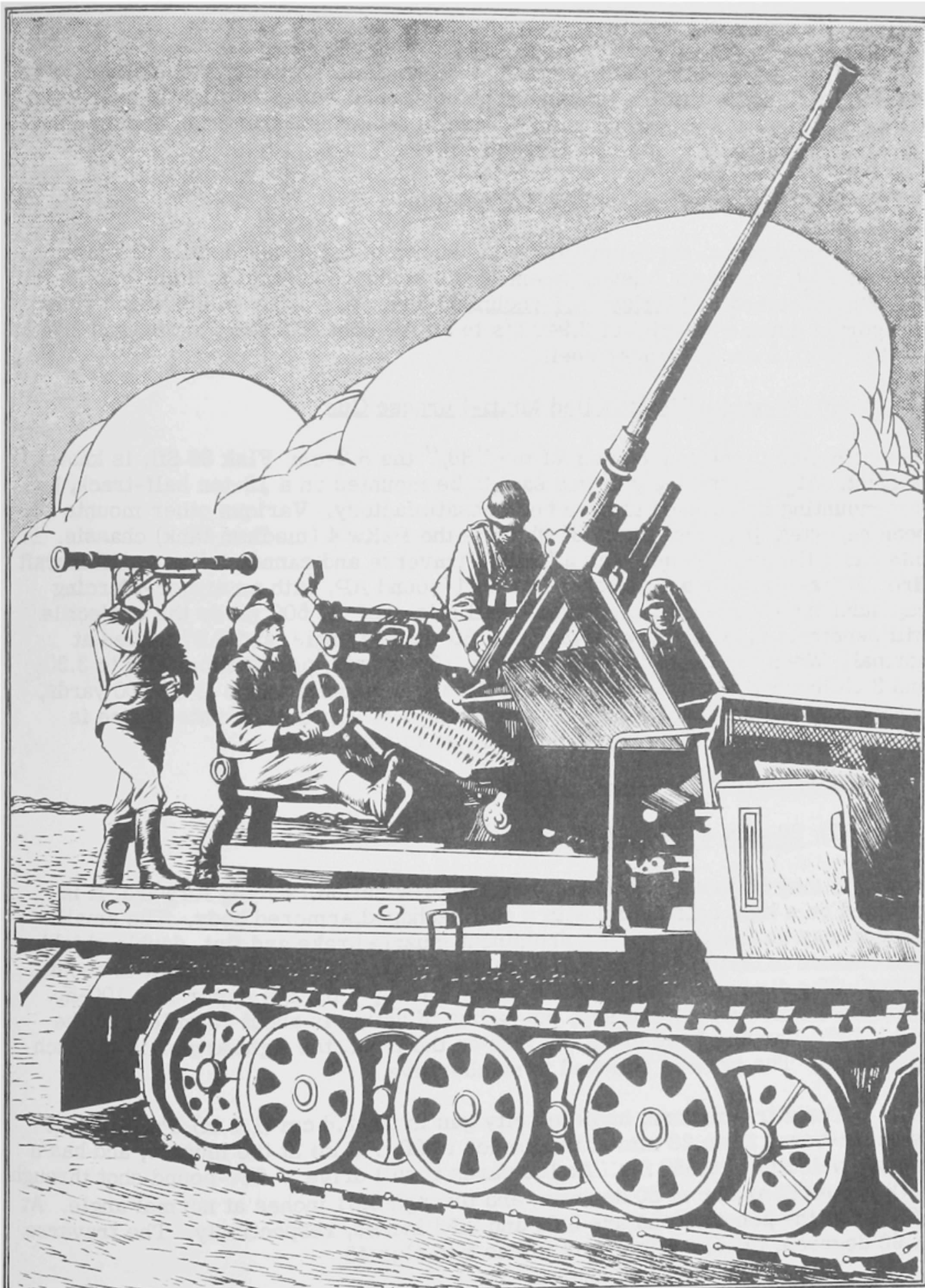


FIG. 2

Like the 20-mm, the 37-mm Flak 36 is a high-velocity gun, delivering an HE shell at 2,690 f/s at the muzzle. The horizontal range is slightly over 7,000 yards, and the rate of fire, 60 rpm. There is all-around traverse, and an elevation of from minus 5 to plus 85 degrees.

(4) 50-mm Self-Propelled AA/AT Gun

This weapon, the 5-cm Flak 41, is known to exist, but details are lacking. Presumably, it may be a development of the standard 50-mm antitank gun (5-cm Pak 38) described in Tactical and Technical Trends, No. 15, p. 38, which gives a reported muzzle velocity of 3,940 f/s to an AP shot of 2.025 pounds, and 2,740 f/s to a 4 lb. 9 oz. AP tracer shell.

(5) 88-mm Self-Propelled Multi-Purpose Gun

A self-propelled version of the "88," the 8.8-cm Flak 36 Sfl, is known to exist. At one time the gun was said to be mounted on a 12-ton half-track, but this mounting is believed to have been unsatisfactory. Various other mounts have been reported, the most likely of which is the PzKw 4 (medium tank) chassis. In this case, the gun probably has a limited traverse and cannot deliver antiaircraft fire. It fires a 20-pound HE shell, or a 21-pound AP, with an armor-piercing cap surmounted by a "wind splitter" ballistic cap. At 500 yards the projectile will penetrate 4.33 inches of armor at a 30-degree angle, and 5.07 inches at normal. When the range is lengthened to 1,000 yards, penetration falls to 3.30 and 3.93 inches, respectively. The maximum horizontal range is 16,200 yards, but the sight is graduated to 10,340 yards only. The practical rate of fire is from 15 to 20 rpm. The number in the crew is not stated.

c. German Self-Propelled Antitank Guns

(1) 28-mm AT Gun, Model 41

It may be that this gun is a local improvisation. Firing forward, it is mounted on a light half-track, with a coffin-shaped, armored body. The small weapon may be identified by its prominent muzzle brake and flat, double shield. The chassis is that of a 1-ton half-tracked vehicle. The battle weight is about 6 tons. The dimensions are 15 ft. 6 in. by 6 ft. by 7 ft.; the motor is a 100-hp gasoline engine. Cross country, the radius of action is about 75 miles; on the road, 120. Varying from about .39 inch on the front, the light armor is .32 inch elsewhere. The crew is believed to number five.

The ultra-modern, high-velocity gun is the 2.8-cm (1.1 in) Pz.B. 41. It is choke-bored from 28 mm at the breech to 20 (.79 in) at the muzzle, and has a muzzle velocity of 4,580 f/s. At 100 yards it will drive a .287-pound shot through 2.72 inches of armor at 30 degrees, and through 3.31 inches at normal angle. At 400 yards the penetrations are 2.09 and 2.56 inches, respectively. The traverse is 90 degrees, the elevation from minus 5 to plus 45.

(2) <u>37-mm AT Gun</u>

Like the 28-mm, this gun may be a local improvisation. The obsolete 37-mm antitank gun, with or without a shield. fires towards the front and is mounted on a 3-ton armored half-track; weight in action is 8.4 tons (see figure 3). The dimensions are: length 18 ft. 8 in., width 6 ft. 10 in., height

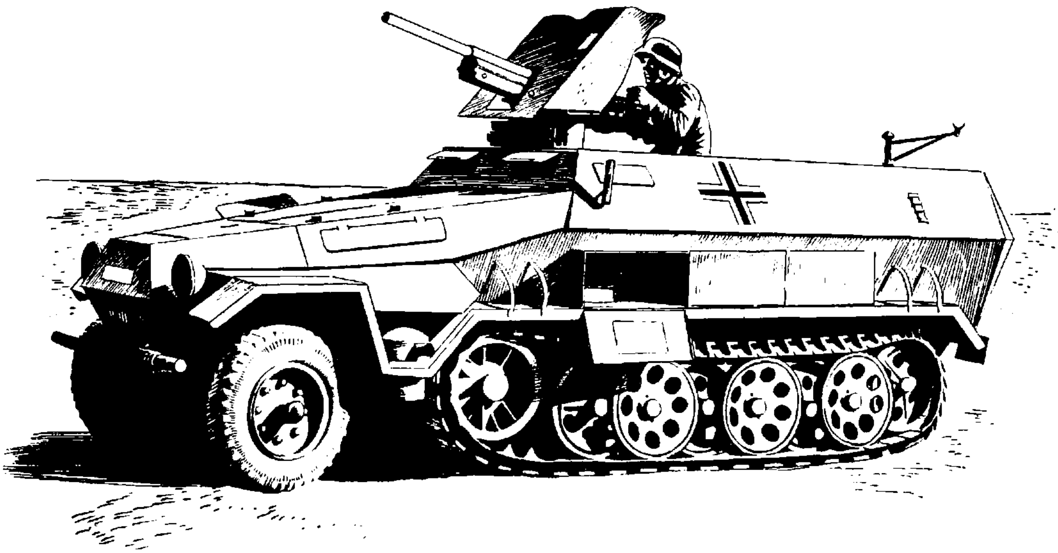


FIG. 3

about 7 ft. 6 in. The gasoline motor develops 100 hp. On the road, the radius is 187 miles, and 81 across country. In front, the armor is from .39 inch to .59 inch in thickness, and on the sides, .32 inch. The crew numbers three.

This gun has a muzzle velocity of 2,500 f/s for the 1.68-pound AP shell and 3,380 (estimated) for the .786-pound AP 40. The HE weighs 1.38 pounds. At 200 yards, the AP shell will penetrate 1.65 inches at 30 degrees and 2.20 inches at normal angle; at 600 yards, 1.34 and 1.81 inches, respectively. The AP 40 at 100 yards pierces 2.68 inches at 30 degrees and 3.11 inches, normal; but with the light AP 40 shot, at 400 yards, the penetration falls to 1.93 and 2.28 inches. The effective range is 600 yards. The maximum traverse is 60 degrees, and the elevation varies from minus 8 to plus 25 degrees.

(3) <u>47-mm AT Gun</u>

This piece of equipment is the Czech antitank gun mounted in a three-sided shield on the turretless chassis of the PzKw 1 Model B tank. It may be recognized by the five bogie wheels (of which the rear four are partially obscured by a girder), a front sprocket, a rear idler, and four return rollers. The gun-

shield is open at the back and top. The gun is fitted with a muzzle brake, and the recuperator is above the barrel. The weight is 7.5 tons; the dimensions 13 ft. 7 in., 6 ft. 7 in., and 7 ft. A 100-hp gasoline engine will drive the vehicle on a radius of action of 70 miles cross country and 90 on the road. The crew is three.

The Skoda gun has a 30-degree traverse with an elevation of from minus 8 degrees to plus 12. The AP tracer shell, 3.68 pounds, has a velocity of 2,540 f/s, penetrating at 300 yards 2.32 inches of armor at 30 degrees, and 2.99 inches at normal angle. At 1,000 yards the respective penetrations are 1.85 and 2.44 inches. An HE shell of 5.07 pounds and and AP 40 shot of 1.81 pounds are used. The effective range is not stated, but is apparently 1,000 yards. About 74 rounds are carried.

(4) <u>50-mm AT Gun</u>

The only evidence of this equipment is a photograph, which showed a long-barreled gun in a fixed, square turret on an armored half-tracked vehicle of unconventional design. There is a large muzzle brake at the end of the gun, which is believed to be the standard 50-mm Pak 38.

(5) <u>75-mm AT Gun, on a PzKw 38(t) Chassis</u>

This equipment consists of the 75-mm (2.95-in) antitank gun (Pak 40) mounted on the turretless chassis of the light Czech PzKw 38(t). The suspension consists of four large Christie-type bogie wheels, two return rollers (mounted above the space between bogie wheels 1 and 2, and 2 and 3, respectively), a front sprocket, and a rear idler. In action, the weight is 10 tons. The dimensions are 15 ft. 3 in. by 7 ft. by 7 ft. 2 in. A 125-hp gasoline motor gives a radius of 143 miles on the road, 103 cross country. A plate of .98-inch armor with, possibly, an additional plate of the same thickness riveted on, protects the front. The sides are 1.18 inches toward the front, and .59 inch toward the rear of the sides and the back of the hull. The crew is probably four.

The gun is a 75-mm antitank piece, thought to have a performance similar to the 75-mm long-barreled tank gun mounted in the latest PzKw 4's. This latter gun has the moderate velocity of 2,400 f/s, giving a penetration (presumably with a 15-pound, capped AP projectile) of 3.5 inches at 500 yards at a 30-degree angle, and 4.25 inches at normal. At 2,000 yards, the shell pierces 2.44 and 3.03 inches. There is an AP 40 shot supplied for this gun, and a 12.5-pound HE shell.

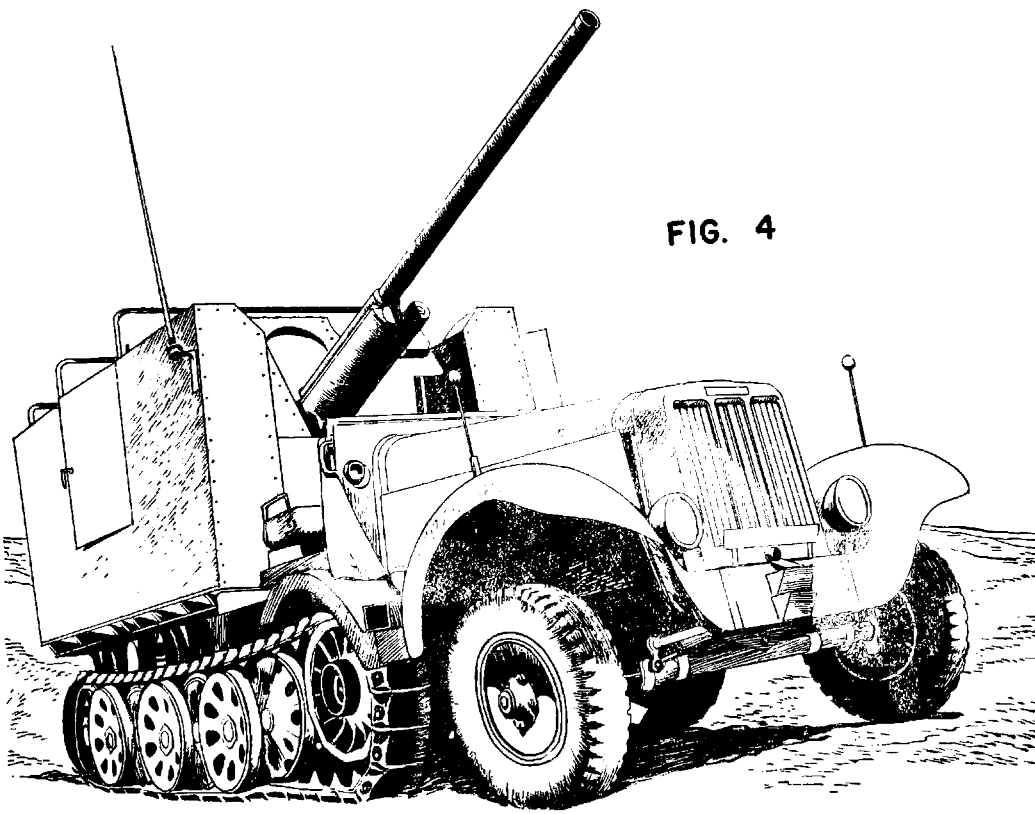
(6) <u>75-mm AT Gun on a PzKw 2 Chassis</u>

This 10-ton assembly may be recognized by the long-barreled gun with the muzzle brake, as in the previous description, but the PzKw 2 chassis has either five or six large bogie wheels. Its length is 15 ft. 2 in., width, 7 ft. 4 in., and height 16 ft. 6 in. With a 140-hp gasoline engine, the radius on the road is 118 miles, and cross country 78 miles. In front, the armor varies from .59 inch to 1.79 inch, with .59 inch on the back and sides. The crew is probably four. The gun is the same one described in the previous paragraph.

(7) 76.2-mm (3-in) AT Gun on a 5-Ton Half-Track

Possibly another local improvisation, this piece of equipment consists of a Russian 76.2-mm gun mounted on the chassis of a 5-ton half-track in a high, square, box-like riveted structure of .20-inch armor, open at the top (see figure 4). The gun may be employed both in field artillery and antitank roles.

FIG. 4



The weight is about 10 tons. The mount is 19 ft. 9 in. long, 7 ft. 3 in. wide, and 10 ft. high. The motor is a 130-hp gasoline engine, giving the weapon a radius of action of 160 miles on roads and 70 across country, carrying a crew of probably six.

The 76.2-mm Russian field gun Model 36 (7.62-cm Pak 36 (r)) with a long, thin barrel throws a 14.8-pound capped armor-piercing shell at the relatively low velocity of 2,200 f/s, a 14-pound HE at 2,340 f/s, and an AP 40 shot of 9.25 pounds weight at 2,800 f/s. The range is not stated, but the firing charts include ranges up to 2,000 yards, at which range it is claimed that the AP shell will drive through 2.08 inches of armor with a 30-degree slope, and 2.52 inches, vertical. At 500

yards, the penetration is reported to be 3.11 and 3.70 inches, respectively. The awkward-appearing mount gives an unexpectedly large traverse of 60 degrees, with an elevation varying from minus 5 to plus 45 degrees. (The gun mount is capable of giving 75 degrees of elevation, but the shield fouls the front tarpaulin rail at 45 degrees.) Sixty-four rounds are carried, approximately half HE and half AP.

(8) 76.2-mm Gun on Tank Chassis

This is the 76.2-mm Russian gun just discussed, mounted on the light Czech PzKw 38(t) chassis with 4 bogies as described in Tactical and Technical Trends, No. 21, p. 6 (see figure 5); it is also mounted on the PzKw 2 chassis

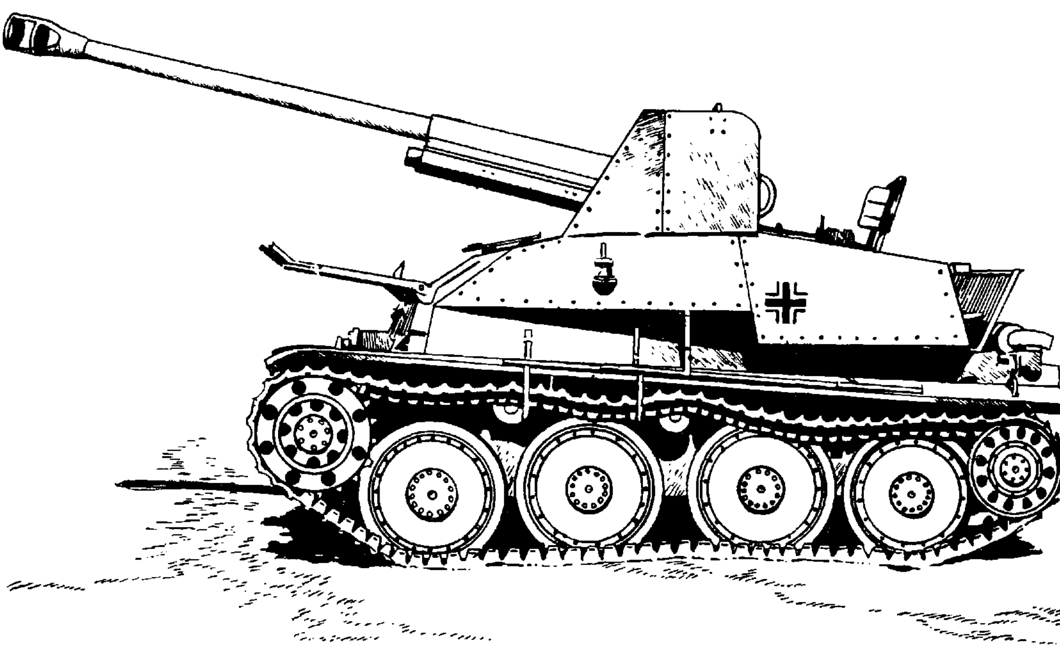


FIG. 5

which has 5 bogie wheels. Both chassis are rather light for so large a gun. It seems unlikely that either the traverse or elevation on these tank chassis is as great as on the 5-ton half-track.

d. German Self-Propelled Assault Guns

(1) 75-mm Assault Gun

A low silhouette, a well-armored body, and a short gun firing forward characterize this assault gun. (See Tactical and Technical Trends, No. 7, p. 9.)

The mount is the chassis of the PzKw 3. The suspension consists of six small bogies on each side with three return rollers, a front sprocket, and a rear idler. The vehicle with its weapon is heavy - nearly 20 tons. It is 17 ft. 9 in. long and 9 ft. 7 in. wide, but only 6 ft. 5 in. high. A radius of 102 miles by road and 59 cross country is attained with a 300-hp gasoline motor. The crew is four. Probably, this model is no longer in production.

With its casemate mount, the short-barreled 75-mm gun has a traverse of only 20 degrees, and an elevation varying from minus 5 to plus 20. For HE shell, the gun is sighted to 6,550 yards; for AP, only 1,640. At 500 yards, the penetration is 1.81 inches in 30-degree sloping armor, and 2.16 inches in vertical; at 1,200, it drops to 1.57 and 1.89 inches. The HE shell weighs 12.6 pounds; the AP shell, with cap and ballistic cap, 14.81. There is an AP hollow charge of unstated weight, as well as a 13.56-pound smoke shell. In the bins of the carrier, 44 rounds are carried, and about 40 more may be stacked on the floor. A dozen stick grenades (potato mashers) may also be carried clipped on a rack.

(2) <u>75-mm Medium-Length Assault Gun</u>

This machine is essentially similar to the foregoing, except that a gun 30 calibers long mounted in a large box-like casing has replaced the stubby piece in the earlier model.

(3) <u>75-mm Long Assault Gun</u>

The third assault gun model is a long-barreled "75" with a prominent muzzle brake. It, too, is mounted on the PzKw 3 chassis (see figure 6). The

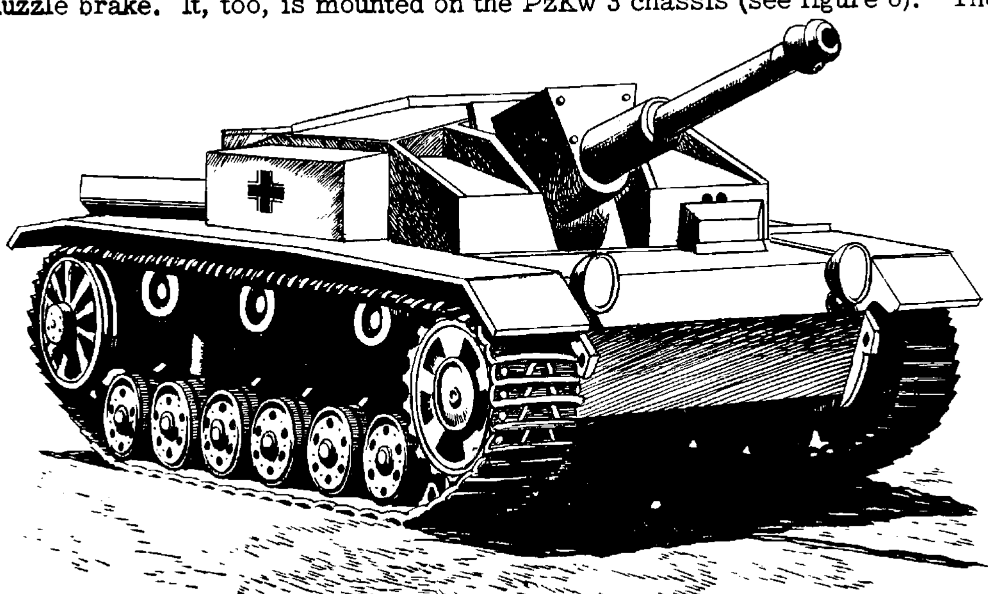


Fig. 6

velocity has been increased to 2,400 f/s, with a resulting increased penetration

at 500 yards of 3.5 inches of sloping armor and 4.25 inches of vertical; at 2,000, the penetration is still formidable--2.44 and 3.03 inches. It is thought that this gun is primarily a tank-destroyer weapon.

(4) <u>75-mm Gun Mounted on a 3-Ton Half-Track</u>

Probably another local improvisation, this weapon is mounted on an armored half-track. The mounting is the same as that used for the 37-mm antitank gun, the details of which are given in c (2) above. (If the 76.2 Russian gun is a little heavy for a PzKw 2 mount, a 3-ton half-track would seem extremely light for a 75-mm piece.)

(5) <u>150-mm Infantry Howitzer on PzKw 1 Chassis</u>

Probably retaining its original wheels and trail, this medium howitzer is mounted on the semiobsolete PzKw 1-B chassis. This chassis has five bogies (of which the rear four are partially obscured by a girder), four return rollers, a front sprocket, and a rear idler. Above the chassis floor is a high, three-sided gun shield, open on the top and back. The weight is about 9 tons. In length, it is 13 ft. 7 in.; in width, 6 ft. 7 in.; and the height is 11 ft. A radius of 95 miles on the road and 70 miles cross country is given by a 100-hp gasoline engine. Front and sides are protected by .59-inch armor, and back by .28 inches, and the gun shield is thought to be only about .39 inch. Four men make up the crew.

The piece is the normal 150-mm heavy infantry howitzer (15-cm s.I.G.33) with a muzzle velocity of 790 f/s and a range of 5,125 yards. The recuperator is underneath, and extends almost to the end of, the short barrel. On the field mounting, the traverse is 11 degrees, and the elevation from 0 to 73 degrees. Ammunition weights are 83.6 pounds for the HE shell, and 84.7 for the smoke.

(6) <u>150-mm Infantry Howitzer on PzKw 2 Chassis</u>

A close-support piece of great power has been made by mounting a 150-mm howitzer low behind a three-sided shield on what is possibly a redesigned PzKw 2 chassis. (See <u>Tactical and Technical Trends</u>, No. 22, p. 13, and No. 13, p. 6.) In place of the usual five large bogie wheels, there are six (see figure 7), suggesting that the normal PzKw 2 chassis has been lengthened, or a new chassis designed. There are four return rollers, a front sprocket, and a rear idler. The weight is about 11 tons. The length is about 18 ft.; the width is 7 ft. 4 in., and the height has been kept down to 5 ft. 6 in.--a remarkably low silhouette. A 140-hp motor gives a radius of action of 118 miles on the road and 78 miles across country. The frontal armor consists of two plates, .59 and .79 inch thick. Sides, back, and shield have .59 inch, and the superstructure .39 inch. The crew is probably four. As in the previously described weapon, the gun is a short heavy infantry howitzer, with the recuperator almost as long as the barrel.

e. German Self-Propelled Medium Artillery

(1) 105-mm Gun

Nothing is known of the mount except that it is armored. The gun is thought to be the standard 10-cm K 18 of which the following are some of the particulars: muzzle velocity 2,660 f/s; maximum effective antitank range, 2,060 yards; penetration with 34.6-pound armor-piercing shell at 500 yards, 30 degrees slope, 5.49 inches, and vertical, 6.46 inches; penetrations at 2,000 yards, 4.39 and 5.22 inches. A capped, AP shell and a 33.5-pound HE shell are reported.

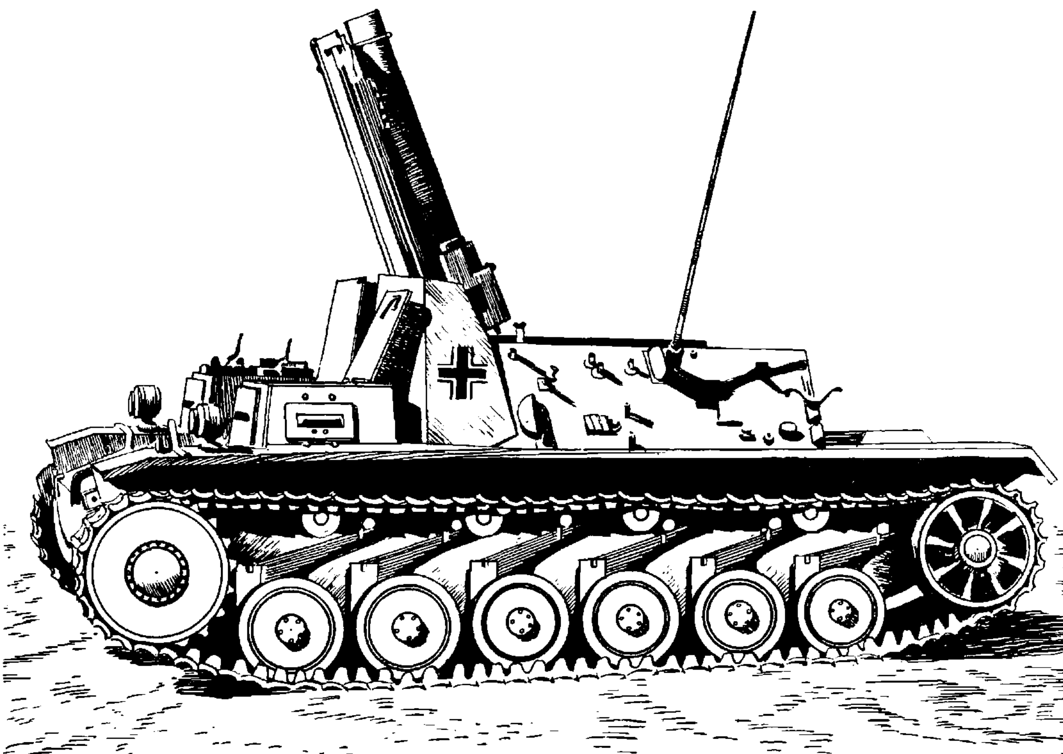


FIG. 7

(2) 105-mm Gun-Howitzer

Nothing is known of the mount, but the gun performances are believed to be as follows: muzzle velocity (super-charge), 1,540 f/s; range, 11,640 yards. Shell weights vary between 31.25 pounds for the AP tracer to 35.9 pounds for the hollow-charge.

(3) 128-mm Gun

Both this gun and the 105 were probably produced to deal with the heaviest Russian tanks. No details are available as to the gun or the mount.

(4) 150-mm Howitzer on French 38L Mount

Attention is called to the account in Tactical and Technical Trends, No. 12, p. 15 of this 150-mm howitzer mounted on the 6-bogie chassis of the French tracteur blindé 38L (see figure 8). The hull is divided into 3 compartments: the

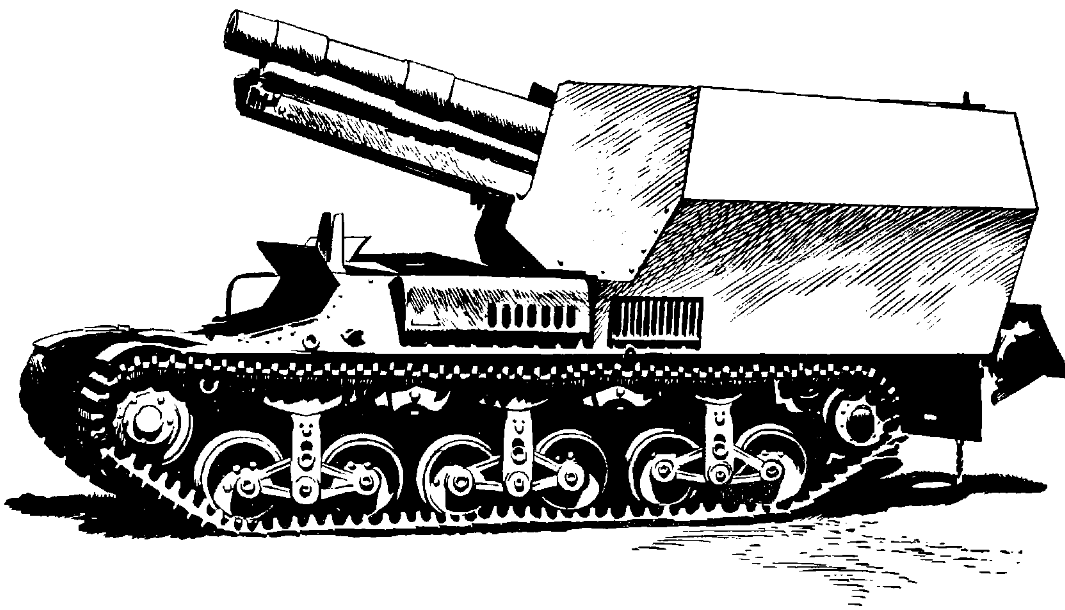


Fig. 8

driving compartment in the front, the engine in the center, and a deep, well-protected cockpit for the gun crew in the rear. The assembly is light (7 1/2 tons). It is 14 ft. long and 5 ft. 2 in. wide, with a 70-hp engine giving a speed of 22 mph. The radius of action is not stated. Armor protection is from .37 to .47 inch in front,.35 inch on sides and rear, and .24 inch on the superstructure. The fixed gun housing, mounted in the floor of the chassis, is of rather thin plate. Traverse is limited to about 4 degrees, and a rear spade is provided to take up recoil stresses. The crew is four.

While the 150-mm assault guns, previously described, are 150-mm infantry howitzers firing an 86-pound shell, this medium howitzer has a longer barrel, which gives a muzzle velocity of 1,250 f/s instead of 790 to a shell of 92.4 pounds weight. The range is 9,300 yards as against 5,125. HE shells, and anticoncrete and smoke shells, are provided. It is notable that in this case a self-propelled gun firing a 92-pound shell to so great a range has been developed on a weight limit of 7.5 tons.

f. Italian Self-Propelled Guns

(1) 75/18 Gun-Howitzer

This seemingly effective, self-propelled equipment is the chassis of the M13, mounting a 75/18 gun-howitzer (see figure 9). The turret and part of the

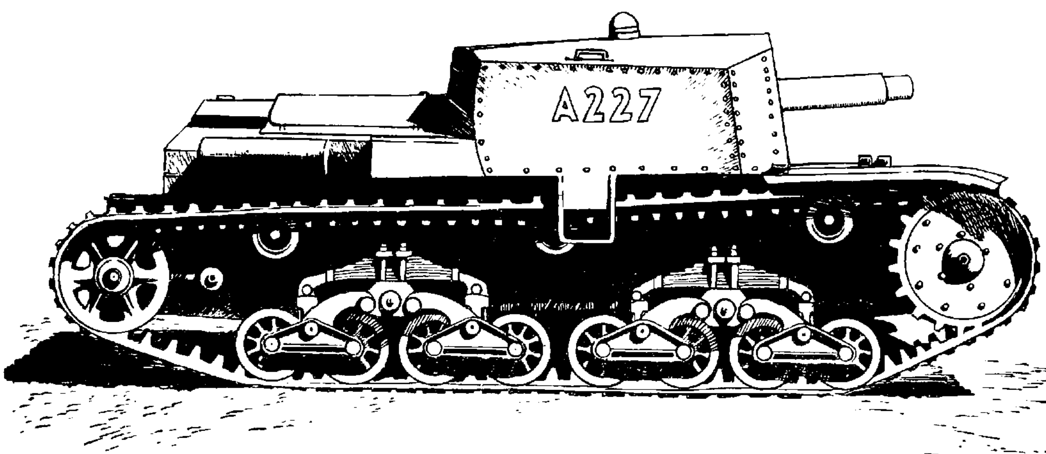


Fig. 9

superstructure of the tank are removed, and a new vertical front plate is fitted, as well as new side plates without the hull entrance-doors. The fighting compart ment is roofed with .39-inch plate. Ready for action, the gun weighs about 11 tons. It is 16 ft. 2 in. long, 7 ft. 3 in. wide, and only 5 ft. 10 in. high, presenting a rather squat appearance. The unusual engine is a 105-hp Gasolio, burning a a mixture of gasoline and fuel oil. On the roads, the radius is about 120 miles. The cross-country radius is not stated. The armor is substantial: 1.69 inches on the gun mantlet, and two plates, 1.46 and .91 inches, forming the front vertical plate. Sides and tail plates are .98 inch. The crew is three.

The gun has a traverse of 45 degrees and an elevation of from 15 degrees minus to 25 degrees plus. It is an 18 caliber weapon with a maximum range of 8,350 yards. The ammunition consists of 13.9-pound HE shell, 14.1-pound AP, and a 14.5-pound shrapnel. Storage for only 29 rounds is provided, but many more will certainly be carried.

(2) The 75/27 Gun, Truck Mounted

It has been reported that there is in service a somewhat clumsy self-propelled mount comprising a 75/27 gun on the back of an unarmored "S.P.A." truck. The standard small shield is retained and a second small shield mounted in front of it; the trail legs are shortened and clamped to the chassis. The gun fires forward over the hood of the truck.

The gun is rather better than the 75/18, with a muzzle velocity of 1,675 f/s. The elevation is from minus 15 to plus 65 degrees; the traverse is practically 60 degrees. In addition to the HE, shrapnel, and AP shell already noted, the gun fires a 13.79-pound streamlined HE, a 15.9-pound case-shot* and a hollow-charge shell.

(3) 75/27 Antiaircraft Gun, Truck-Mounted

This is an obsolete 75/27 Krupp antiaircraft gun mounted on a Ceirano 50 C.M.A. 53-hp truck, or a Fiat 18 BL 40-hp truck. Both are four wheeled. The Ceirano truck has a radius of 150 miles on the road; the Fiat, 112. The gun has a muzzle velocity of only 1,675 f/s, with a horizontal range of 6,600 yards and vertical range of 15,200 feet. The elevation is 70 degrees, the traverse 160. A 14.5-pound, time-fuzed, HE shell is fired.

(4) 90/53 AA/AT Gun, Truck-Mounted

This is a 90/53 AA/AT gun mounted on a four-wheeled 60-hp Lancia Ro truck. It is probable that the gun can be used only against ground targets. The radius of action is about 150 miles.

A muzzle velocity of 2,756 f/s gives the 22.2-pound HE shell a range of 19,100 yards. The practical rate of fire is from 15 to 20 rpm. The elevation is from slightly below horizontal to 85 degrees, and the traverse, 360. An AP shell of unknown weight is reported to penetrate 4.41 inches of plate on a 30-degree slope at 500 yards, and 5.63 inches of plate at the vertical. At 2,000 yards, the respective penetrations are 3.15 and 4.13 inches.

(5) 90/53 AA/AT Gun on a Tank Chassis

It has been reported that the 90/53 gun is now found on a mount of entirely new design in the center of what appears to be a tank chassis, firing forward, with a 40-degree traverse. The muzzle is said to slightly overhang the front of the chassis. The chassis itself is stated to be identical with that of the earlier M 13/40 medium tank as regards suspension, armor, and appearance, but the engine is more powerful. In order to fire the gun, the tracks, apparently, have to be locked by the steering levers. Only a limited number of rounds can be carried. The crew is probably six. Whether the chassis is used for the 90/53 self-propelled gun only, or is that of an M15 tank, is at present obscure.

g. Japanese Self-Propelled Artillery

Information regarding Japanese self-propelled guns is entirely too indefinite to warrant any statement. However in October 1941, the British reported a Japanese self-propelled gun, of which but one has been seen, perhaps an experimental model. It is supposed to be a weapon of about 100-mm caliber mounted in the

*Similar to shrapnel, for close range.

chassis of a medium tank. The piece is said to be long, and to have no shield. The gun may be the 105-mm howitzer, Model "91" (1931), of which the following is known: muzzle velocity 1,790 f/s; maximum range, either 11,500 or 14,200 yards; maximum elevation and traverse (both), 45 degrees. The ammuntion is a 35-pound HE shell.

CORRECTIONS

ORDNANCE

No. 23, p. 25: In a report on the Italian 8-mm Breda medium machine gun, model 37, it was here stated that the German 7.92-mm ammunition could be used in this weapon. This statement is incorrect.

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WAR DEPARTMENT

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SECTION I

AIR

1. AERIAL BOMBING ATTACKS ON AIRCRAFT

For some time past isolated reports have been received of aircraft, usually Japanese Zekes and German FW-190s, dropping bombs in the path of our bombers. Recent information indicates increasing use of these aerial bombs.

The Japanese bombs appear to weigh from 50 to 100 pounds, and can be clearly seen from the time they leave the enemy plane. They explode about 5 to 10 seconds after leaving the plane, producing a vivid color, followed by white smoke streamers (which might indicate phosphorus) in a waterfall effect. One officer is of the opinion that if one of the larger bombs exploded inside of a five-plane Vee it might set most of the planes on fire, because of its intense heat. The bomb-fuzing system used may be either mechanical, functioning after a pre-determined time or after a pre-determined distance of fall; photo-electrical, functioning when a photo-electric unit in the bomb "sees" the target aircraft; or acoustic, functioning when the acoustic unit "hears" the target.

In some cases that have been observed in the Southwest Pacific Theater, the Japanese pilots have approached the American formation from head on, but at higher level, and have tried to time their release so as to have the bombs explode near the leading ship. After dropping the bombs, they pull up in a climbing turn. The force of the explosion, estimated from the blast effect on our planes, was stated to be about the same as that of a heavy antiaircraft shell, the blast giving nearby aircraft a severe tossing around.

The aerial use of bombs was first reported in May, 1942, in the Solomons area. A Zeke flew about 1,000 feet above and ahead of a formation of B-25s and dropped an object which exploded in front of the leader in a burst of bluish smoke and fragments. The bomber turned sharply and avoided it. The Zeke then turned and delivered a frontal attack on the B-25s. A few days later a B-17 was attacked by Zeke fighters. About the middle of June, our bomber formations in the Aleutian area were bombed by Zeke fighters.

Recently, during an attack by seven Type "O" single-engine fighters on a single Fortress, it was reported that the first formation of four Zekes climbed to a position directly above the B-17, when all four planes made a simultaneous release of small objects which exploded on a level with the B-17 but about 75 to 100 feet astern. The three other fighters, which had been flying on a parallel course, attacked the Fortress immediately after the explosions, opening fire at a range of 400 to 500 yards, and pressing the attack to within 150 yards. Having made their attack, they changed positions with the first four fighters and the entire procedure was repeated.

In a more recent report from the Solomons area, it is stated that a formation of 9 B-17s, while attacking Japanese destroyers, was intercepted by 8 to 10 Zekes which carried 2 aerial bombs apiece. Starting from an altitude of 15,000 feet, they dived and released the bombs above the B-17s after the pull-out. The bombs burst in front of the formation at a range of 20 to 150 yards.

Another B-17 formation was returning from a raid in the South Pacific when two or three float biplanes were observed flying approximately 2,500 to 3,000 feet above them. A bomb-shaped object was seen to drop from one of the planes. It exploded a very short distance above and to the right of the formation. A similar occurrance was reported with Zero's flying approximately 2,000 feet above the formation, while a float-biplane off at the side gave data to the fighters as to the altitude and the speed of the B-17s.

In spite of these attacks, to date there has been no report of substantial damage to our planes by Japanese bombs.

The Germans have likewise been experimenting with bombs of a similar nature. Reports from two Fortresses returning from a raid on the French coast are to the effect that, when they were proceeding at about 9,000 feet, two FW-190s dived to a position about 150 feet above them, and each released a cluster of bombs. The bombs burst about 20 yards behind the Fortresses, level with them or slightly above, without doing any damage.

FW-190s have bombed Fortresses from 1,000 feet while 3,000 feet ahead on a left right-angle course. The explosions occurred 600 feet ahead but level with the bombers, and appeared to be from bombs 6 to 10 inches in diameter dropped from wing racks. Altitude information was apparently supplied by Ju-88s flying level with our planes. In another raid, some damage to our planes was sustained by fragments from aerial bombs which appeared to be time bombs, 18 inches long and dropped singly. Information received from North Africa indicates that German and Italian fighters are apparently dropping bombs on our B-24s, and that one may have been destroyed in this manner. Apparently without sighting, 20- to 30-pound bombs are released by the fighters at 1,500 to 3,000 feet above the bombers, after the latter's altitude has been measured by level observation. Fuzes appear to be set for detonation in a vertical line 50 feet apart. One observer reported that a formation of B-17s flying over the French coast at 23,000 feet was attacked by dive-bombers, and the right elevator of one plane was severed by a bomb explosion forcing it down out of control. Other crews have described aerial bombing by FW-190s, which approached at 6 o'clock 4,000 to 5,000 feet above and released one 100-to-500-pound bomb each. Both white-and-gray and red-and-black bursts 30 feet in diameter have been seen. However, no definite pattern to these attacks has so far been indicated.

Although the Axis powers have not up to date had any particular success with the dropping of time bombs, such tactics may be encountered on an increasing scale, for it seems probable that they are making definite attempts to develop this form of attack.

2. LOW-LEVEL FIGHTER-BOMBER RAIDS

Bomb-carrying FW-190 fighters were reported in action for the first time in July, 1942. During the last few months, the enemy has been employing certain specially trained units called "Jabos" for daylight fighter-bomber operations over the south coast of England. Analysis of these attacks reveals a certain uniformity of method and execution.

The aircraft, usually FW-190s alone but sometimes including Me-109s, approach from the sea at low altitudes varying from sea level to 500 feet, but generally between 50 to 100 feet. They fly in echelon or loose line astern, making landfall at some distance to the side of the target near an easily recognizable landmark, such as a headland. They proceed inland until on the flank or in the rear of the objective and then turn to attack, rising to 100 to 200 feet for a single indiscriminate bombing and machine-gun run at full speed across the target area (each aircraft carrying one 1,100-pound bomb). The time spent over the target is about 5 seconds in the normal hit-and-run raid involving 1 to 4 fighter-bombers. The flight home is then made in loose formation.

The attacks have usually been pressed home with a reasonable amount of determination, and in general reveal signs of coordinated attack, although recent reports have indicated some deterioration of effort in this respect. However, the raids are often carried out under conditions of poor visibility and by scattered aircraft at irregular intervals.

Because of the low altitude at which the planes approach, radio detection equipment is seriously limited, with the result that antiaircraft defenses are frequently unable to come into action before the attack has been delivered. The planes have, in fact, been over their targets before warning could be given. The enemy uses the configuration of the coast or of the ground in the vicinity of the target to provide cover during the approach, and often the aircraft are seen only momentarily between obstacles such as trees and houses.

Targets vary considerably and may include shipping in harbors, port installations, a coastal radio direction-finder station or airdrome, railway stations, electric or gas plants, or simply general raids against a coastal town, irrespective of military importance. The general preference appears to be for purely civilian targets as opposed to those of military value.

A later development in Jabo raids was to provide cover for the homeward flight. Since a low-altitude approach makes visual or radio detection very difficult, danger from British fighters arises chiefly only during the first part of the homeward flight. The protecting fighters therefore fly over the Channel at altitudes as high as 10,000 feet to await the return of the Jabos, thus being in a position to attack from above any British fighters which may be chasing the Jabos home.

The number of FW-190s and Me-109s used in these raids seems to be increasing, and recently daylight attacks appear to have been largely abandoned in favor of night sorties. No appreciable damage has been inflicted on military objectives, but civilian targets and personnel have suffered to a certain extent.

The raids appear to be for the purpose of affecting civilian morale and keeping defenses on a continuous alert. In general, however, they have had merely a nuisance value.

ANTIAIRCRAFT

3. GERMAN 128-MM AA GUN

The 128-mm (Flak 40) antiaircraft gun, which exists in both mobile and static versions, is also mounted on railroad cars. The predictor used is Kommandogerät 40 (Üg 37), which is also used to control the 88-mm (3.46-in) and 105-mm (4.14-in) AA guns. The performance of the 128-mm (Flak 40) is at present unknown, but details may be similar to those previously published* for the 127-mm AA gun.

These figures, which remain unconfirmed, are:

Length of bore	50 cals
Muzzle velocity	2,500 f/s
Max. horizontal range	19,600 yds
Max. vertical range	42,600 ft
Weight of projectile	55 lbs
Rate of fire	8 rpm
Elevation	0° to 90°
Traverse	360°

ANTITANK

4. DEVELOPMENT OF GERMAN TANK AND ANTITANK GUNS

A detailed analysis of the chronological development of German tank and antitank guns is presented in the following report, which is preceded by an examination into the basic requirements for tank and antitank guns. All of the information contained in this article comes from British sources.

*   *   *

a. Theory

In order to bring into proper perspective the various lines of German antitank and tank gun development, it may be useful first to consider various

*See TM 30-450, p. 333 (Handbook on German Military Forces) and MIS, Special Series, No. 10, p. 45 (German Antiaircraft Artillery).

factors which influence design, and to consider also the effect of design on both actual performance and lethal or destructive effect.

(1) The Problems of the AT Gun

The principal requirements for an antitank gun are the following:

(a) Ability to perforate the enemy's tank armor at the maximum range at which accurate engagement can take place;

(b) A projectile which will not only penetrate the armor but cause sufficient mechanical damage inside the tank, or personnel casualties, to disable the tank as a fighting vehicle;

(c) Ease of maneuver and concealment, requiring a carriage and a total weight which will permit speed into and out of action, and a low silhouette;

(d) A high rate of fire, a flat trajectory, and an accurate sight to enable it to engage relatively small and moving targets;

(e) Protection for the gun crew against machine-gun fire as a minimum, and against AP and HE projectiles and bomb near-misses as an optimum;

(f) An HE projectile which will enable the gun effectively to engage soft-skinned targets, when the opportunity offers and does not conflict with the gun's primary task.

(2) The Problems of the Tank Gun

Insofar as a tank gun under modern conditions is expected to be able to deal with enemy armor, most of these same conditions will apply, with an additional condition imposed by the need for economy of space in a tank.

(3) The Problems of Projectiles

(a) General

The ability of a projectile to penetrate armor depends to a great extent on the velocity at which it strikes the target, and to a lesser extent on its weight and on the angle at which it strikes. It follows, therefore, that given equality of projectile design, material, weight, and angle of strike, the higher the muzzle velocity at which the projectile is fired, the greater the thickness of armor which will be penetrated at a given range.

It also follows that given equal muzzle velocity and quality of projectile design and material, the heavier the projectile the less the penetration performance will decrease as range increases, since the heavier projectile maintains its speed through the air better and the descending curve of remaining velocity is flatter.

The heavier the projectile, the more difficult it becomes to achieve in practice a high muzzle velocity without being forced by mechanical considerations to heavy guns and bulky ammunition. Hence the antitank gun-designer is immediately faced with several problems. Is he prepared to accept a light projectile with a high muzzle velocity, relatively rapid deceleration, loss of striking power at longer ranges, and relatively slight lethal effect, in order to be sure of penetrating thick armor at the shorter ranges? If he is, he will have to take a chance on securing a direct hit on a vital spot to get results.

Is he prepared to accept a lower scale of penetration at the shorter ranges with a heavier projectile, which will, however, keep up its performance better, and do more damage at extreme ranges wherever he gets a hit? And if he decides to take as his target a thickness of armor of X inches, which no normal antitank gun of manageable proportions will defeat, how is he going to get the extra velocity to drive his projectile through it?

(b) A German Solution: The Tapered-Bore Gun

In general, increased velocity can be obtained in three ways: by increasing the pressure in the gun behind the projectile, by lengthening within limits the bore of the gun (and consequently the travel of the projectile under pressure), or by increasing the area of projectile upon which a given pressure acts. The first method increases the weight of the gun; the second also gives an unmanageable barrel for field purposes (for instance, a 3-inch high-velocity gun, using suitable propellant, might require a barrel length of about 100 calibers, or 25 feet); the third tends to give a projectile of bad ballistic shape. The tapered-bore or Guerlich design adopted by the Germans for certain of their weapons employs the third method, but gets over the disadvantage mentioned by gradually reducing the base area of the projectile as it travels through the bore, thus bringing it to a proper ballistic shape by the time it leaves the muzzle.

With the Guerlich design they have managed to produce guns of light weight capable of penetrating exceptional thicknesses of armor at the shorter ranges of engagement. For this performance they have had to sacrifice a great part of the destructive effect inside the tank. A projectile from a straight-bore weapon of, for instance, 3-inch caliber weighs about 15 pounds, and in penetrating the armor not only throws into the tank large pieces of disrupted armor from a 3-inch hole, but follows through either intact, or in fairly large fragments, to cause widespread damage. On the other hand, the projectile from a tapered-bore gun of the same entrant caliber weighs only about 6 pounds and will emerge as slightly less than 2 1/4-inch caliber. Owing to its design it will only force a hole of about 1 1/4-inch diameter in the armor, and owing to the material of the core, internal damage will be restricted to that done by small fragments within a fairly narrow cone opening out from the point of impact.

It must also be borne in mind that with high velocity (i.e., greater than about 3,500 f/s muzzle velocity), it is necessary to employ a tungsten carbide core to enable the projectile to give full penetrative value for its high velocity. The necessary raw material (wolframite) is not in such generous supply that the

wholesale arming of every antitank gun with such a projectile could be contemplated.

In the event of a hit failing to penetrate, damage done by the light high-velocity projectile will be negligible compared with that caused by the equivalent normal projectile. However, taking everything into consideration, the tapered-bore gun is potentially a very serious threat to the heavier armor, particularly if a succession of hits can be obtained; but if only one hit is obtained, the probabilities of causing immediately disabling damage are relatively low. It is not a weapon which can, with advantage, engage in long-range duels with any adequately armed tank. It would not for instance prove profitable in the open African desert, where duels at ranges of up to 2,500 yards are common, but in the close conditions of some European countrysides it might find all the conditions for its profitable employment satisfied. In more open conditions, the normal straight-bore weapon with its heavy projectile will have every advantage.

With a tapered bore, effective engagement of soft-skinned targets is difficult of fulfillment. High performances with both AP and HE projectiles from the same gun are incompatible, and while it is possible to compromise with a normal straight-bore weapon, losing a bit each way, there can be no compromise with a tapered-bore antitank gun, and HE performance must be sacrificed.

b. Developments

The rapidity with which the German forces have expanded and developed their tank and antitank armament is among the outstanding technical performances of this war. New weapons have appeared in quick succession, in turn to be superseded or improved, and throughout there has been a parallel development and improvement of ammunition.

At the end of 1939, the German Army had one standard antitank gun, the 37-mm Pak. To supplement this, they had to call on the heavy antiaircraft equipment, the 88-mm Flak. They had tank guns of 1934 vintage, the 20-mm Kw.K 30, the 37-mm Kw.K, and the 75-mm Kw.K. The antiarmor performance of tank guns was low.

Early in 1941, the German Army had, in addition to the 37-mm Pak, a new 28-mm tapered-bore,* light antitank gun, the Pz.B** 41, primarily for airborne troops and infantry, and a new 50-mm antitank gun, the 50-mm Pak 38. As a stopgap, the Czech 47-mm antitank gun was also being used. The 37-mm Kw.K had been dropped from their tank armament, and in its place came a moderately effective 50-mm tank gun, the 50-mm Kw.K.

In addition, early in 1942 the German Army had put to use as an antitank gun the Russian 76.2-mm field gun, of which considerable numbers must have been captured. This was the first heavy antitank gun under the control of German

* Tapers to 20 mm at the muzzle.
** Abbreviation for "Panzerbüchse" literally "antitank rifle."

ground forces.* The antitank armament of airborne troops had been considerably strengthened by the introduction of a new tapered-bore gun, the 42-mm Pak 41, which tapers to 28 mm at the muzzle. The 50-mm tank gun used in 1941 was replaced by the long-barrelled 50-mm Kw.K 39 based on the very successful 50-mm Pak 38. An improved 20-mm gun, the Kw.K 38, had been provided for light tanks and armored cars, though later models of some of these have the 50-mm Kw.K 39.

The tables below show the remarkable change in the hitting power of their armament. The guns listed under 1939 were those then in use; those under 1941 and 1942 first appeared in these respective years.

(a) Antitank Guns

1939	37-mm Pak (2,500 f/s)
1941	37-mm Pak (obsolescent) 28-mm Pz.B 41 (4,580 f/s) 47-mm Pak (t) (2,540 f/s) (Czech) 50-mm Pak 38 (2,700 f/s)
1942	37-mm Pak (obsolete) 42-mm Pak 41 (4,500 f/s) 50-mm Pak 38 (2,700 f/s) 76.2-mm Pak 36 (r) (2,200 f/s) (Russian) 75-mm Pak 97/38 (2,100 f/s) (French) 75-mm Pak 40 (2,800 f/s) 75-mm Pak 41 (4,000 f/s)

(b) Tank Guns

1939	20-mm Kw.K 30 (2,600 f/s) 37-mm Kw.K (2,500 f/s) 75-mm Kw.K (1,350 f/s)
1941	20-mm Kw.K 30 (2,600 f/s) 50-mm Kw.K (2,500 f/s)
1942	20-mm Kw.K 38 (2,600 f/s) 50-mm Kw.K 39 (2,700 f/s) 75-mm Kw.K 40 (2,400 f/s) 88-mm Kw.K 36 (2,600 f/s) 75-mm Kw.K 41 (4,000 f/s)

*Practically all German antiaircraft units belong to the GAF.

(c) Ammunition

1939	1941	1942
AP shell HE shell	AP shell A.P.C.B.C.* shell (1.25% HE) AP 40 shot HE shell	A.P.C.** shell A.P.C.B.C. shell (.31% HE) AP 40 shot HE hollow charge shell HE shell

c. Comment on Latest Developments

(1) Antitank Guns

It is quite clear that since 1939 a very great effort has been made to bring into service an efficient antitank gun for every type of combat unit. Even the airborne and parachute troops have had special provision made for them in two light tapered-bore weapons. Most important of all, the Army is now no longer dependent on the GAF for its heavy antitank weapon.

The Army had to obtain from the GAF, on loan, Flak units armed with the 88-mm gun, because it was the only gun in the German service with the requisite performance. The gun crews were GAF personnel, the equipment was not designed to an Army specification, and whether they were made available or not depended in some cases on the personality of the two commanders involved. The GAF for their part has had undoubtedly to suffer pressure from time to time with a view to their releasing Flak units to the Army, and to the employment of these units in a purely AT role to the detriment of AA defense, mainly a GAF responsibility. However, the multi-purpose AA/AT weapons were retained.

The Army must have insisted on having its main antitank weapons produced to its own specification and organized as an integral part of the Army. They now have the 75-mm Pak 40, which weighs about 1 3/4 tons in action as against almost 5 tons for the 88-mm, has the same performance against armor up to 2,500 yards as the 88-mm, can be produced with greater ease, and will be manned by Army crews. In the 75-mm Pak 41, which also weighs about 1 3/4 tons, they have a weapon which will give them performance adequate to defeat, under European fighting conditions (i.e., up to 1,500 yards), any homogeneous armor not thicker than 100 mm, and correspondingly greater thickness at shorter range.

As originally produced, the 75-mm Pak 40 only had a muzzle velocity of 2,400 to 2,500 f/s, and it seemed as if a still more powerful weapon must be developed. Now, however, this gun has been modified; a muzzle velocity of about

*Armor-piercing capped with ballistic cap (British abbreviation).
**Armor-piercing capped (British abbreviation).

2,800 f/s is obtained, and armor-piercing performance is up to that of the 88-mm Flak 36. Therefore, this weapon, along with the 75-mm Pak 41, provides a very powerful combination for all ranges up to 2,500 yards. The Germans may well decide to leave occasional super-heavy tasks to the divisional 105-mm guns and the 105-mm Flak of the GAF. This should not be taken as meaning that they will not proceed with the development of a still heavier antitank gun, but rather that production will probably, for the present year, be concentrated on the 75-mm equipment. Any heavier antitank gun may well take the form of an improved 88-mm multi-purpose gun with higher muzzle velocity and a suitable field mounting. (Sketchy reports of an 88-mm Flak 41 much more powerful than the Flak 36 are now starting to come in.)

(2) Tank Guns

Since 1939 a radical change of policy is evident. The 1939 tanks, insofar as gun-power was concerned, could barely fight against the French tanks. The short-barreled 75-mm gun in the PzKw 4 was intended primarily as a close-support gun. Even today it is being used in that role, and has recently been mounted in some PzKw 3 tanks and 8-wheeled armored cars. It should be noted that German tanks have always carried a considerable amount of HE. The killing of soft-skinned targets and antitank guns is always a consideration in their policy.

In 1942 the PzKw 3 and PzKw 4 were rearmed with high-performance long-barreled guns, the 50-mm Kw.K 39 and the 75-mm Kw.K 40, respectively.

These two new guns, together with the 75-mm Kw.K 41 (tapered bore), and the 88-mm Kw.K 36, suggest an interesting line of policy. The demand from the German Army in Africa was undoubtedly for a gun throwing a heavy projectile and keeping its penetration performance up over 2,000 to 2,500 yards. This appears to have been met by the provision of the 88-mm Kw.K 36 mounted on the PzKw 6.

It is doubtful whether the Germans would accept desert conditions, in which so small a proportion of their forces were engaged, as a basis for their major weapon-production program. They are more likely to base this on Russian and European conditions. This seems to have led them to the 75-mm Kw.K 41, a lighter gun with a shorter and lighter (16 1/2-lb) round, but with an armor-piercing performance markedly superior to the 88-mm at any range below 1,500 yards.

The performance of the 75-mm Kw.K 40 is not as good as that of the 88-mm Kw.K 36 at any range, but it is probable that having here a good gun, they will aim at improving its performance.

(3) Ammunition

There has been a marked tendency in the past year to improve the anti-armor performance of AP projectiles, first by reducing the HE capacity of the heavier AP shell, and second by the continued development of high-velocity shot with tungsten carbide core. This suggests that a compromise armor-piercing

explosive projectile is not acceptable now that substantial thickness of armor has to be dealt with. The latest design of the 75-mm A.P.C.B.C. projectiles has so low an HE capacity as to suggest that this projectile has been included because their troops have become used to a shell that will burst inside the tank, and sudden elimination of the base fuze and explosive feature might worry them. In other words, the Germans are for practical purposes using shot for the attack of thick armor, and retain for every weapon HE for the attack of soft-skinned targets.

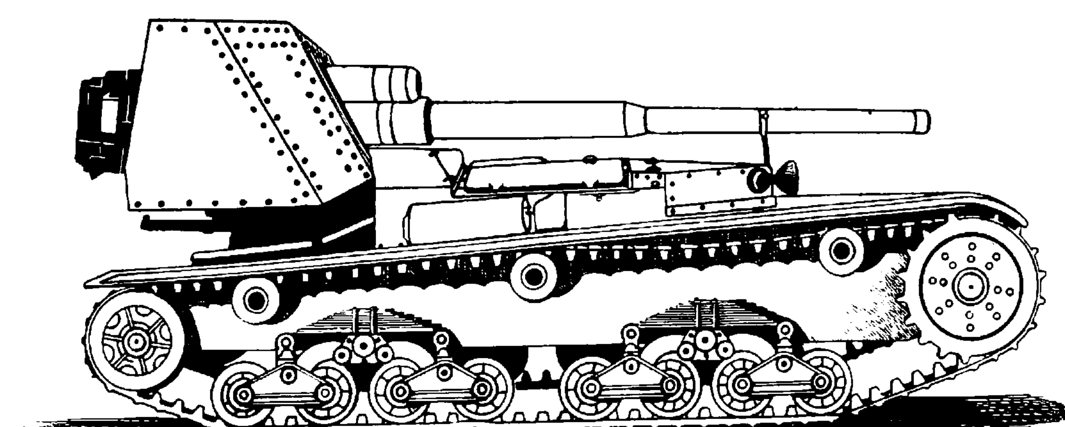
It also seems clear that they have been expecting the Allies to go to face-hardened armor, or else they decided some time ago that a piercing cap so improves the performance against any type of armor that the extra production time is justified, since there are now no uncapped AP projectiles in production for anything above 20-mm caliber.

It is a fact that both the 75-mm Pak 40 and Kw.K 40 are provided with hollow-charge in addition to the A.P.C.B.C. and HE, with the expressed intention that the former should not be used for extreme ranges for the reason that it is a low-velocity projectile.

There is every reason to believe that these shells would be of great use against heavily armored pillboxes, armored vehicles, and tanks, because of the "cavity charge" effect.

5. ITALIAN 90/53 SELF-PROPELLED GUN

There has been a previous reference in Tactical and Technical Trends (No. 25, p. 48) to the Semovente (self-propelled) 90/53* gun. Further information on



this Semovente 90/53 (3.54-inch) self-propelled AA/AT gun has been received.

*Caliber 90 mm, length of bore 53 calibers.

On the basis of the present report, it appears that this gun is mounted on the rear of a turretless 14-ton, Model 14/41 tank chassis. In order to accommodate the gun, it would appear that the normal positions of the engine and transmission in the hull have been rearranged. The engine, normally in the rear, seems to have been moved forward to the center of the hull, access being provided by two doors in the superstructure roof. There is probably room for one member of the crew besides the driver in front of the engine. It would seem that the engine is overloaded, so that the vehicle is slower and less maneuverable than the M 14/41 tank. The speed probably does not exceed 12 mph. Presumably the 125-hp Diesel engine of the M 14/41 tank is retained.

ARMORED FORCE

6. NEW MODEL PzKw 2

A damaged PzKw 2 tank has been captured in Tunisia by the British, with 6 bogie wheels instead of the usual 5 on each side. The front vertical plate is in one piece and extends straight across the full width of the superstructure, instead of being in two sections with the right side inclined at an angle of about 45 degrees to the rear.

7. COMBAT TACTICS OF GERMAN MEDIUM TANK COMPANIES

a. General

The following combat instructions for PzKw 4 units have been condensed from a German document. They give an excellent idea of recent enemy tank tactics.

b. Individual Tactics

(1) In view of the small amount of ammunition carried, the gun is normally fired at the halt in order to avoid waste. The machine guns mounted in turret and hull may be effectively fired up to 800 yards against mass targets, such as columns, reserves, limbered guns, etc.

(2) As soon as each target has been put out of action, or as soon as the attacking German infantry are too near the target for tanks to fire with safety, the tanks move forward by bounds of at least 200 to 300 yards. When changing position, drivers must take care to keep correct position in the tactical formation.

(3) Single tanks may be used for supporting action against prepared positions. The tank will normally move from a flank under cover of smoke. Embrasures will be engaged with AP shell. During action, it will be necessary to blind neighboring defenses by smoke. Tanks will normally fire at prepared defenses

from at most 400 yards' range. Assault detachments work their way forward, and once lanes have been cleared through the antitank defenses, the tank will follow and engage the next target. Close cooperation between tank and assault detachment commanders is essential. Light and other signals must be prearranged. Single tanks can also be used in fighting in woods and for protection of rest and assembly areas.

c. Platoon Tactics

(1) During the attack, medium platoons move forward in support of the first wave; one half of the platoon gives covering fire while the other half advances. The whole platoon seldom moves as a body.

(2) The platoon commander directs by radio, and he can control fire by radio or by firing guiding-rounds on particular targets.

(3) Antitank weapons will normally be engaged from the halt. If the nearest antitank weapon can be dealt with by the light platoon, the medium platoon will engage more distant antitank weapons or blind them. Artillery will be attacked in the same manner as antitank weapons. Enfilading fire is particularly recommended.

(4) If friendly light tanks encounter enemy tanks in the open, the medium platoon should immediately engage them with smoke-shell in order to allow the lights to disengage and to attack the enemy from a flank.

(5) Moving targets and light weapons should be engaged with machine guns or by crushing; mass targets with HE.

(6) Against prepared defenses, the procedure is as mentioned in Paragraph b (3). When the whole platoon is employed, the advance can be made by mutual fire and smoke support. When the position is taken, the platoon covers the consolidation by smoke and fire. The platoon only moves forward again after the enemy weapons in the prepared position have been knocked out.

(7) In street fighting a medium platoon may be employed in the second echelon to give support. Nests of resistance in houses may be cleaned up with the help of the tanks' guns, and lightly built houses can be crushed.

(8) If a front-line tank formation is ordered to hold an objective until the arrival of infantry, protection will be given by the medium platoon, which will take up position on high ground with a large field of fire.

d. Company Tactics

(1) When medium platoons are attached to light companies, they work on the latter's radio frequency, and not on that of their own medium company.

(2) Reserve crews follow immediately behind the combat echelon and move back to join the unit trains only after the beginning of an engagement. They come forward again as soon as the battle is over. Reliefs must be so arranged that drivers take over refreshed before each action, that is, on leaving the assembly area.

(3) The repair section, commanded by an NCO, travels with the combat echelon until the beginning of the battle.

(4) The company commander moves at the head of his company until the leading platoons have gone into action, when he operates from a temporary command post with unimpeded observation of the battle area. Keeping direction and contact are the responsibility of company headquarters personnel while the commander is at the head of his company.

(5) In the attack, the normal formations are a broad wedge (<u>Breitkeil</u>),* or line with extended interval (<u>geoffnete Linie</u>). Effective fire of the whole company may be obtained if the rear elements give overhead fire, or if they fill up or extend the front of their company to form line.

(6) For tank-versus-tank actions, the company, where possible, should be employed as a whole. When enemy tanks appear, they must be engaged at once and other missions dropped. If time allows, the battalion commander will detach the medium platoons that have been attached to light companies and send them back to the medium company. In all situations, medium tanks should endeavor to have the sun behind them.

(7) During the pursuit, the medium company will be employed well forward in order to take full advantage of the longer range of its HE shell.

<u>e</u>. <u>Miscellaneous</u>

(1) The light tank platoon of battalion headquarters company guides the medium company on the march, and when going in to rest or assembly positions. If the medium company is moving on its own, one section of a light tank platoon may be attached to it.

(2) Parts of the antiaircraft platoon of the headquarters company may be allotted to the medium company.

(3) Tank repairmen move directly behind the combat echelons. The recovery platoon is responsible for towing away those tanks which cannot be attended to by the repair section. The recovery platoon is under the orders of the technical officer, who has under his control all equipment and spare-parts trucks of the tank companies, which may follow by separate routes as prescribed by him.

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*One platoon echeloned to the right, one to the left, and one in line to form the base of the triangle, with apex forward.

ARTILLERY

8. GERMAN 75-MM RECOILLESS GUN, LG 40*

This weapon is a short-rifled howitzer without a recoil or counter-recoil system, mounted on a light aluminum alloy carriage. A funneled (Venturi) tube is attached to the rear of the bored breechblock; its function is to allow the gases to disperse to the rear, thus eliminating a recoil mechanism. The firing mechanism is seated in a cone-shaped receptacle and centered in the breechblock by vertical struts. The weight of the complete gun is reduced to a minimum by using hollow machined parts, plastic washers, tubular carriage, and aluminum alloy body. Because of the weight of the complete piece, it lends itself to use by airborne troops.

The general characteristics of the gun are:

Date of manufacture	1942
Caliber	75 mm
Weight	
Complete	325 lbs
Barrel	98 lbs
Carriage	63 lbs
Wheels and axles	36 lbs
Breechblock and Venturi tube	66 lbs
Breech ring	62 lbs
Length of gun (over-all)	45 in
Length of barrel	29 1/2 in
Rifling	28 lands and grooves - uniform right-hand twist; one turn in 19 calibers
Maximum range**	3-4,000 yds
Rate of fire**	12-15 rpm
Muzzle velocity	?
Sights**	Cross-leveling gear, and straight tube telescope
Ammunition**	HE and hollow charge
Tube	Monobloc
Elevation	42^{o}-20^{o}
Traverse	60^{o}-360^{o}
Carriage	Platform or tripod type; detachable wheels for transport
Tactical use	AT and antipersonnel

a. Barrel

The tube is of monobloc steel construction. On the breech end, interrupted collars provide for attachment of the tube to the breech rings. It is also machined

*Extracted from a recent Aberdeen Proving Ground report.

**From a British report.

to seat the extractor and the barrel lock. Externally and midway on the barrel, a steel band is clamped. Its purpose is to lock the barrel and the front leg of the tripod in transport.

b. Breech Ring

This part of the gun is recessed to receive the barrel and breechblock. It contains borings for the extractor pin, breech-lever mechanism, "safe and fire" lever as well as the barrel lock. The trunnions for mounting it to the carriage and the elevating rack are also attached to the breech ring.

c. Breechblock

The breech is of the horizontal sliding block type. It is bored to receive the firing housing and firing lever. The firing housing, which acts as a diffuser for gases escaping to the rear, is screwed at the rear to secure the funnel-shaped "Venturi" tube. The breech mechanism lever performs a double function. It operates the breechblock and also cocks the piece when the lever is depressed.

d. Venturi Tube

This funnel-shaped tube is screwed on to the rear of the breechblock. Its purpose is to disperse the gases to the rear, eliminating recoil.

e. Carriage

The top carriage or body is constructed of an aluminum alloy, formed with a circular base. It contains borings for the elevating and traversing mechanisms and lock, as well as the trunnion caps for seating the trunnions. The gun can be traversed 360° by locking the elevating mechanism, but its ordinary traverse is 60°. Elevation is limited to 42° by stops, but the rack can be locked at 20°. At the right side is a bracket for attaching a small spare-parts box.

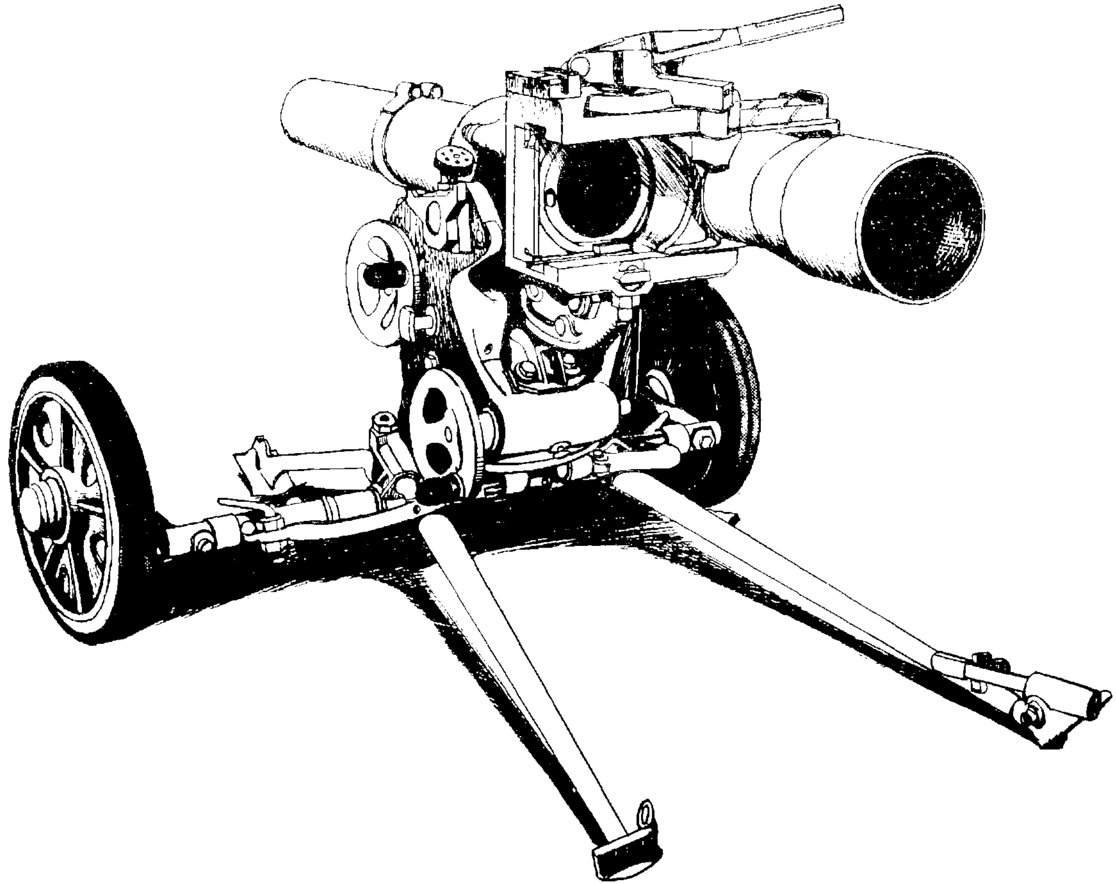
f. Lower Carriage or Platform

The lower carriage consists of the wheels, platform, three tubular legs, tubular guide rails, tubular axletree, base ring traversing rack, and stub axles.

The wheels are light-weight metal disks fitted with solid rubber tires and can be quickly detached from the axletree.

The three tripod legs are pivoted in lugs on the base ring. The front leg can be placed in one of two positions for firing by engaging it in a slot in the center of the axletree. The left and right legs can be placed in two positions by locking them in slots of the guide rail. The three tripod legs have small spades for steadying the gun while firing.

Remarks The method of firing the piece and the types of cartridges, propellants, and projectiles are, and will be, unknown until they are secured. Many



GERMAN 75-MM RECOILLESS GUN

theories have been suggested by observers, but until the projectile is received and fired it remains pure conjecture. No detailed information is available at present concerning the sighting equipment, because the captured weapon arrived in the U.S. without sights of any kind. There is a sight bracket attached to the left side of the carriage.

ENGINEERS

9. ENEMY ENGINEER DELAYING TACTICS

A recent report gives a brief summary of some engineer lessons that were learned during the advance of the British Eighth Army from Benghazi to Tripoli. The operations during the advance demonstrated very clearly the effectiveness of skillfully placed mines and booby traps in delaying an advancing enemy, even though in most cases the obstacles were not covered by fire.

The enemy delaying tactics included demolition of bridges and culverts and the systematic cratering of causeways and roads, wherever defiles occurred through sand dunes, steep rock, or sabakha.* The delaying effect of demolitions was greatly increased by mines and booby traps. The clearing of the latter imposed a heavy task and a very great strain on the engineer units, which were already heavily committed in overcoming the demolitions.

All physical obstacles were liable to be associated either with heavy charges or antipersonnel mines. Barbed wire on stakes was in one case dragged across the road, and to each stake there was attached a pull-igniter in a prepared charge. A barrel obstacle over a culvert was heavily charged and wired, so that removal of the barrels destroyed the culvert and produced another obstacle. The sowing of craters with "S" mines (antipersonnel), and the concurrent mining with antitank mines of diversion on either side, was a profitable enterprise of the enemy sappers. It resulted in very considerably extending the time taken to clear a passage. The "S" mines were placed in the spoil on the lip of the crater. Tellermines were carefully placed in a radius of 50 yards on either side of the road on the line of likely diversions, and in many cases this minefield was again protected by "S" mines.

Enemy minelaying showed every evidence of free improvisation, and little evidence of well-rehearsed drills or consistent policy. Spacings, patterns, wiring-in, and booby-trapping all varied widely, and many minefields were laid at less than the minimum safe spacing to avoid blast or sympathetic detonations.

Concealment of buried mines proved a major factor in determining the delay imposed. Many hundreds of mines were detected by eye and lifted without resort to detectors, recently disturbed earth providing the necessary clues.

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*A smooth, flat, often saline, plain, sometimes covered after a rain by a shallow lake.

Enemy demolition work in ports, while elaborate and fairly effective, was misdirected.

The destruction of side-cut roads on steep hillsides was not fully effective when large charges were placed by shafts sunk on the uphill side of the road. It has been shown that the addition of a smaller charge on the downhill side destroys any "shoulder" on which a repair road could be built. The Germans omitted to do this in one instance, and no retaining walls were required for immediate repairs.

Enemy failure to destroy certain water reservoirs was of great assistance to the advance. In view of the excellent results obtained from boring rigs, mere demolition of sources cannot impose much delay.

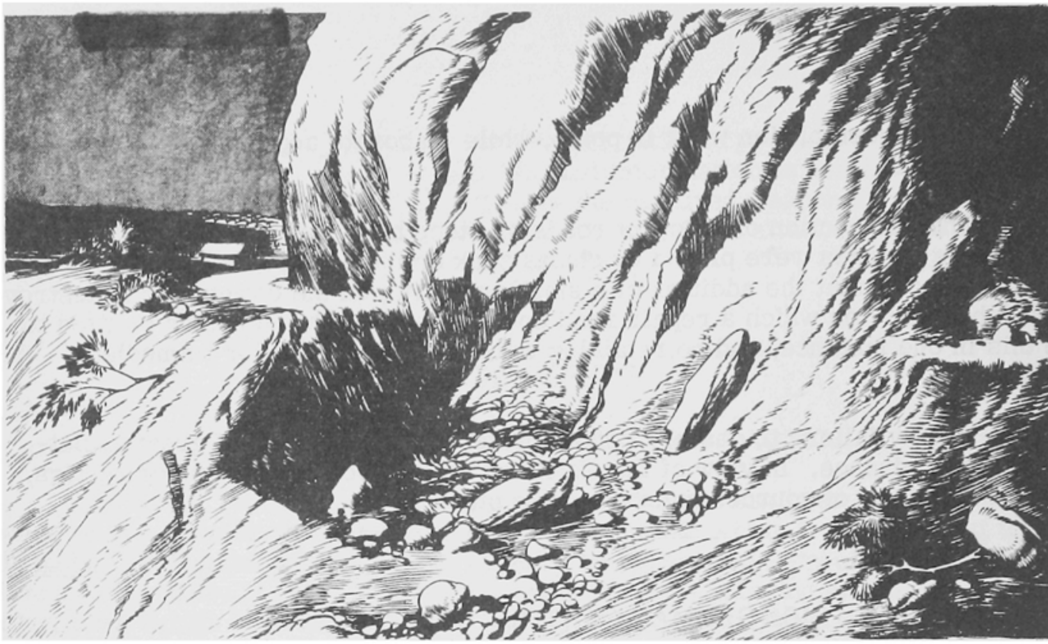
10. GERMAN CONSTRUCTION TROOPS

Since the German Army engineers perform almost exclusively combat missions, such as crossing streams, reducing fortifications, and removing obstacles under fire, the Army includes special construction units for non-combat functions usually performed by engineers in other armies. These construction troops (Bautruppen) form a separate arm of the service, which is divided into specialized groups, such as road, bridge, railway, and fortress construction. Recently the German personnel has been largely confined to the older age groups, and increasing numbers of foreign laborers have been used for the heavy manual work; the construction troops are nevertheless fully capable of giving a good account of themselves if attacked. The Bautruppen are the subject of an article which appeared in an authoritiative German military magazine in October 1940.

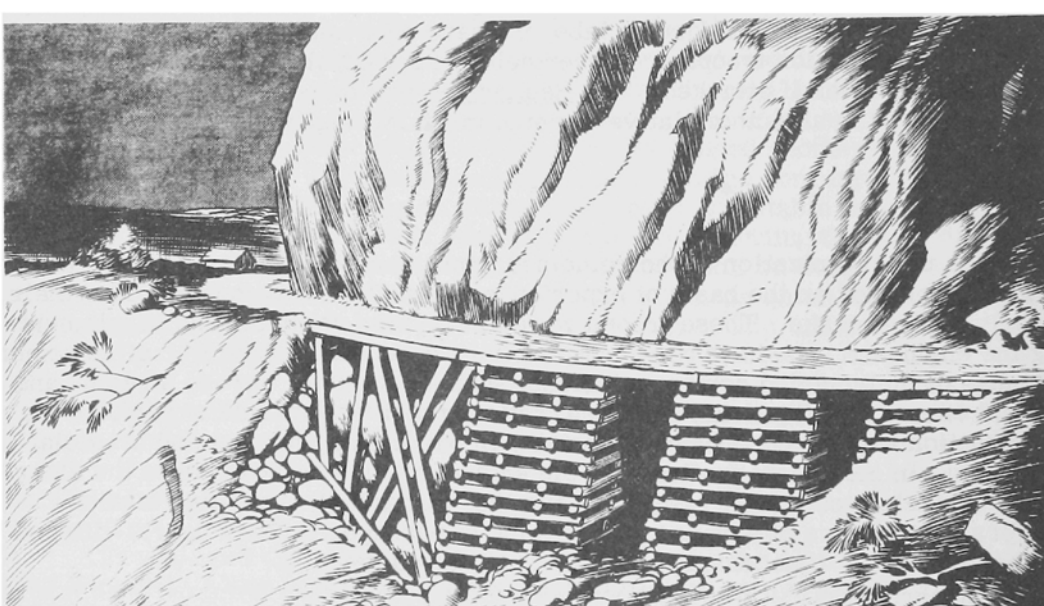
*   *   *

In the organization of the combined arms, the German construction troops, newly established on the basis of experiences in the Polish campaign, have their clearly marked tasks. These troops were created for relieving and supplementing the engineers, who have great responsibilities in the modern war of movement. Because of their varied combat missions, such as attacking across streams and against enemy fortifications, the construction troops are trained to perform the construction work that becomes necessary in overcoming natural and artificial obstacles. In close cooperation with the engineers, this work includes the clearing of obstacles (concrete, rail, post, and tree obstacles), the filling of shell craters on the lines of advance, the opening of passages through debris-littered communities and, if necessary, the building of road detours.

Another mission is the repair and constant maintenance of the heavily taxed advance and supply roads. To take the place of highway bridges demolished by the enemy, the construction troops must build heavy bridges of from 16 to 24 tons capacity for accommodating all army loads. Thus, in the war of movement



BEFORE "The German advance through the Vosges led from Colmar to Gerardmer by way of the road along the ravine pass. The French tried to hold up the German advance. With tremendous dynamite charges they blasted the rocky road before their withdrawal. Where previously a normal automobile traffic prevailed, after the blasting there yawned a tremendous crater in the rock."



AFTER "After six days of work the wooden bridge with a capacity of 16 tons was finished. Even the Fuhrer has taken note of the outstanding work of the army construction troops, as typified by this job, stating that their capabilities of use are practically unlimited in spite of the lack of years of experience."

they create the prerequisites for the forward push of the modern, far-ranging, motorized army. The rail construction troops assigned to the railway engineers attend to the reestablishment and resumption of operation on demolished stretches of track. The fortification construction troops are utilized under the local fortress engineer service-posts in the building of permanent fortified zones.

Not only in building the West Wall, but also especially in execution of our attack operations against our western enemies, the construction troops have been thoroughly tested. By their readiness for service and their technical efficiency, they have contributed to the operations of the German military forces. Even in the reestablishment of utilities service in demolished installations (water, electric power, and gas works) and in the case of canals blocked by sunken ships in enemy territory, the construction troops have given valuable aid. Adequately equipped even for infantry missions, exceptionally efficient because of their training as skilled workers, these troops have shown themselves to be an indispensable auxiliary arm of great versatility in the general organization of the German Army.

11. GERMAN SAFETY-FUZE IGNITERS

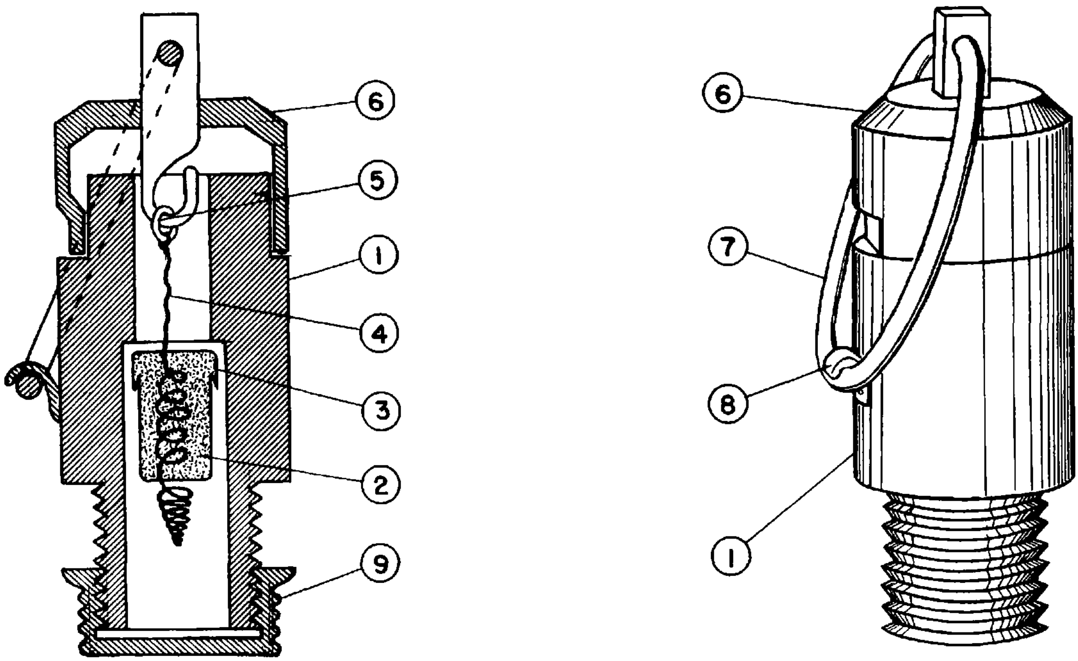
The development of mines as an offensive-defensive weapon has been one of the outstanding features of this war. The importance to all arms of a working knowledge of enemy mines and mine devices cannot be over-emphasized. In a report from the Middle East, the appearance of the Zdschn. Anz. 39 (abbreviation for Zündschnuranzunder--safety-fuze igniter) is noted. It appears that this igniter is to replace the Zdschn. Anz. 29 for normal demolitions. Both of these igniters are illustrated in the accompanying sketches.

a. The Zdschn. Anz. 29

The friction igniter Zdschn. Anz. 29 is normally used for the ignition of safety fuze. When prepared for use, the safety fuze is pressed into one end of a brass tube, and the igniter is screwed to the opposite end of this tube. This igniter has been used with smoke candles, with Tellermines as an initiator to booby traps, and as an initiator when prepared charges were used in hasty demolition. The Tellermine booby trap consists of a detonator which screws into the side or base of the mine. The detonator is attached to the igniter by a short (2 1/2-inch) length of safety fuze. The ring of the igniter is pegged to the ground below the mine.

The body (1--see sketch) of the Zdschn. Anz. 29 is made of brass and contains the copper tube (2) closed by the cap (3). The friction wire (4) passes through the tube which contains the friction composition. The wire is tightly coiled at its lower end to form the resistance to the pull. The other end of the wire (4) is attached to a hook (5) which is soldered into a slot in the cover (6). In order to prevent any rotation of the friction wire, the cover is deeply indented into a corresponding recess in the body of the igniter. A split ring (7) is secured to the body by a curved brass clip (8). When not in use, a protecting cap (9) is

usually screwed on the base of the igniter. This igniter is placed in operation by removing the ring (7) from the brass clip and pulling it. The friction wire (4)



ZDSCHN. ANZ. 29

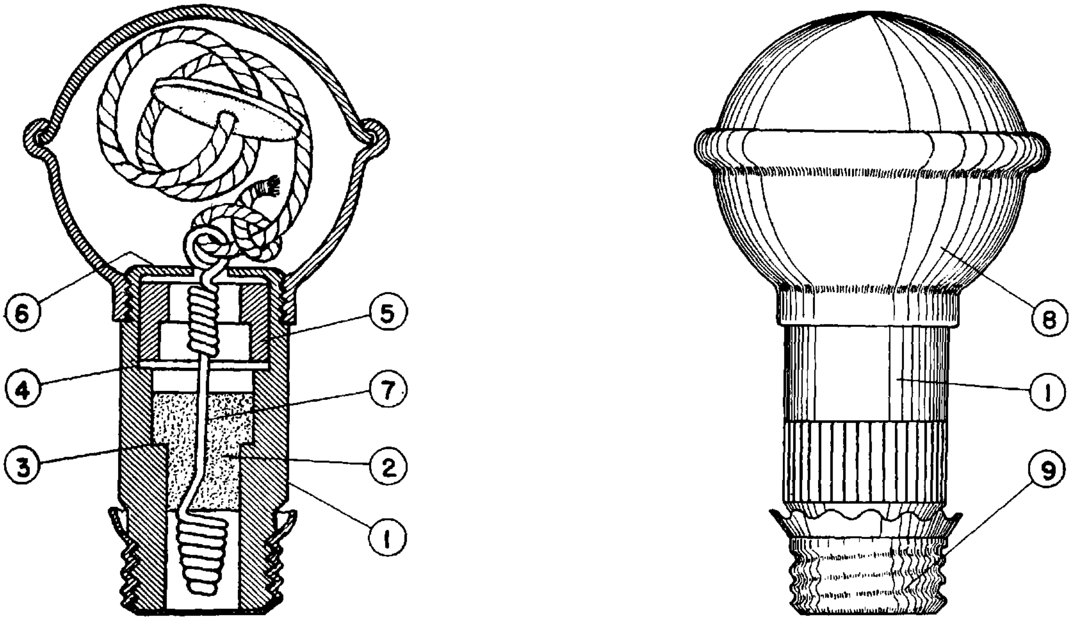
ignites the friction composition. To neutralize the igniter if the ring (7) is free, the cover (6) should be secured to the body by a piece of insulating or adhesive tape.

b. The Zdschn. Anz. 39

The Zdschn. Anz. 39 is used primarily for ignition of safety fuze in normal demolitions. Its use in improvised mines and booby traps, although not impossible, would be inconvenient because of the absence of a suitable means for attaching a trip- or pull-wire.

The body (1--see sketch) of the Zdschn. Anz. 39 igniter has the same dimensions as that of the Zdschn. Anz. 29, and encloses the friction composition (2) which is contained in a copper capsule. This capsule is retained within the body (1) by an internal shoulder (3) and a disk (4), which is secured by a collar (5). The collar is itself secured by the top of the igniter body which is pressed over circumferentially at (6). The friction wire (7) runs through the friction composition and is coiled at its lower end. At its upper end, it is attached to the cap (8) by a short length of cord terminating in a disk. The cap (8) screws on to the top of the igniter. In transit, a brass screw cap (9) of standard type serves to

protect the friction composition. To fire the igniter, the head is unscrewed and the cord pulled, thus forcing the friction wire through the friction composition.



ZDSCHN. ANZ. 39

The safety fuze to be ignited is attached in the same manner as for the Zdschn. Anz. 29 described above.

12. LAND-MINE LAYING FOR ROAD OBSTRUCTION

The following methods of tank obstruction have been adopted by the Germans in the Middle East.

a. Tellermines

In all cases, these were used for roads, laid in potholes to a depth of 2 to 4 inches and covered with sand. In some cases they were laid half on the shoulder of the road and half on the road where the surface had broken away.

Two antilifting methods were used:

(1) A small made-up charge was buried under the mine, complete with pull-igniter and length of wire. The wire was attached to the handle of the mine.

(2) The pull-igniter was screwed into the base of the mine and attached to a wooden peg with a length of wire. In a few instances, it was found that Tellermines were buried below normal detector capacity in what appeared to be potholes squared out for refilling with road surface.

b. French Mines

These were laid on the roadside, in cuts through sand-dunes, and were covered up to look like a normal bank of drift sand. They were laid in nests of up to eight mines to a nest, and to a depth of 18 inches. All mines were laid normally, and in no instance were they connected collectively or individually to antilifting devices.

c. "S" (Jumping) Mines

These were fitted with three-pronged igniters and were used entirely as antipersonnel, in shoulders, loose sand-cuts, and areas where vehicles might detour from the road. In all cases they were well buried to ground level.

d. "Dummy" Mines

To retard the speed of clearing, the enemy buried old cans and pieces of metal well down in potholes but not too far for the detectors to pick up. This had the desired effect, for it undoubtedly retarded progress. Also, heaps of wet sand were laid at the side of the road to look like filled potholes.

e. Craters

In all cases craters were in culverts blown by approximately 15 shells, detonated by a small charge and a length of fuze. The result was an effective crater, the complete width of the road and 4 to 5 feet deep. Tellermines were laid at a radius of about 50 yards from the center of the crater, where vehicles would normally make a detour in order to return to the roadway. They were buried either with or without antilifting devices. "S" mines were not found in the crafter itself, but up to three per crater were found in the loose soil around it, and in the road shoulder about 10 feet from the edge of the crater.

13. RUSSIAN DEFENSES BEFORE MOSCOW

A brief description of the Russian line of defenses in front of Moscow has been translated from an authoritative German military publication. In the account below, it will be noted that the numbers refer to defense zones on the sketch map.

* * *

Twenty-five miles was the depth of the defense zone which the Soviets had built in front of their capitol to block the way of the German armies. Seven

different systems, some very narrow, some in depth, were designed to make the obstacle zone impregnable (see sketch map). At (1) on the map is a long line of flame-throwers (figure 1), of which the tanks were buried in the ground with only the nozzles extending above ground level. On the approach of German soldiers, these devices were to be electrically fired from a hidden bunker.

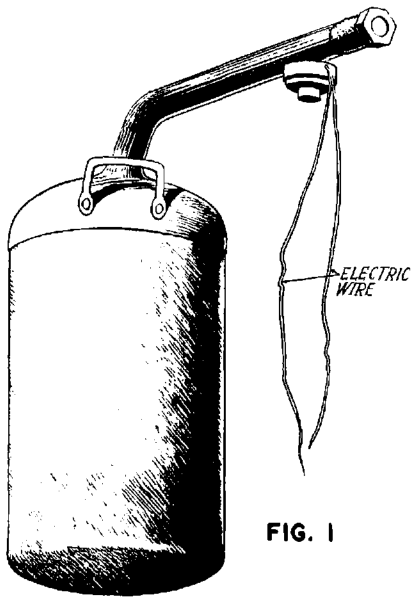


FIG. 1

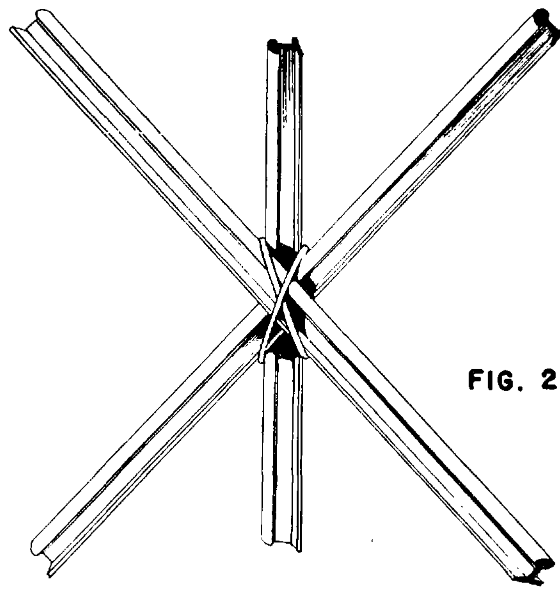
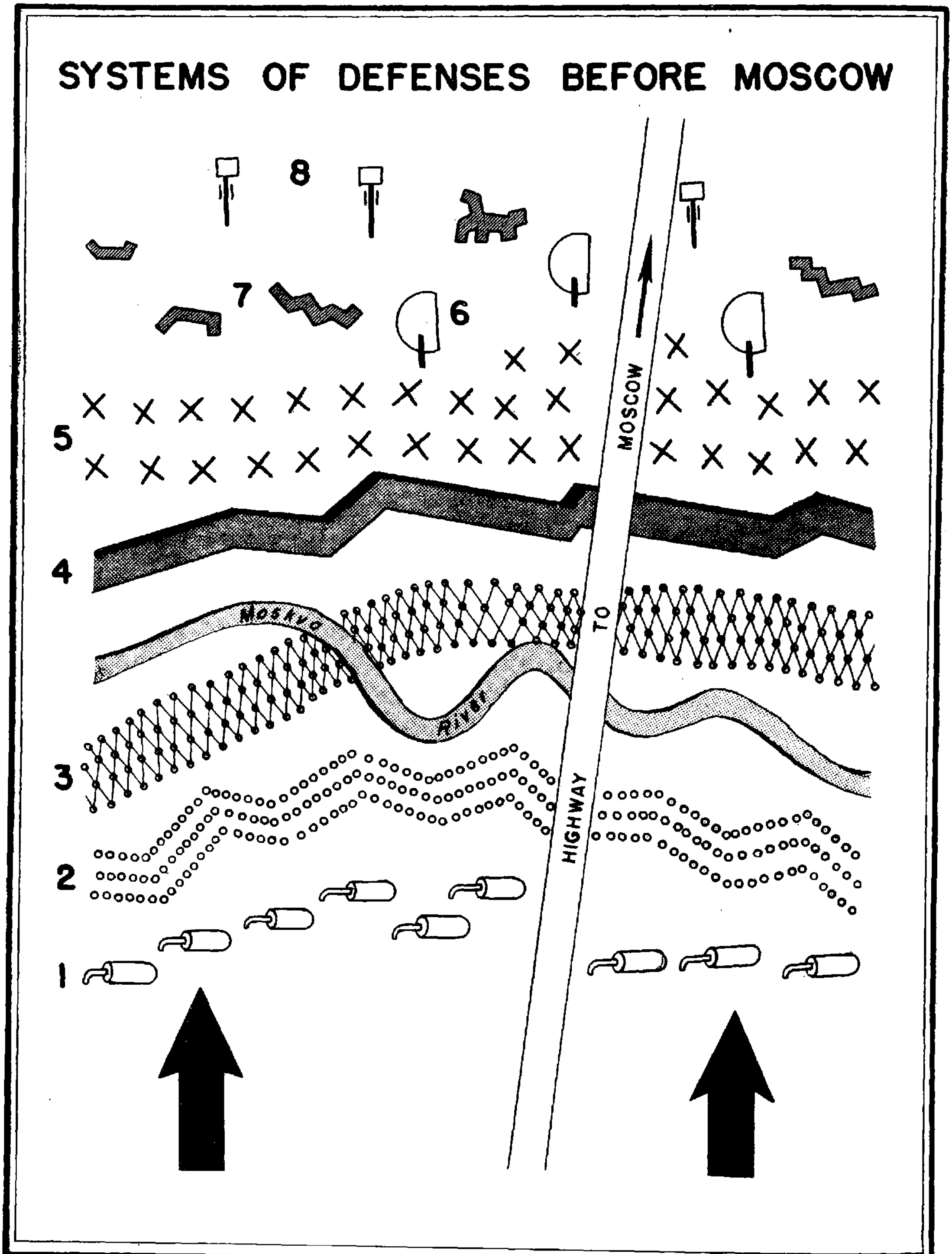


FIG. 2

A deep system of trenches set with upright logs to trap tanks is indicated on the sketch map at 2. The German troops called them "asparagus beds." In addition to the log obstacles, the trenches were heavily mined. Closely adjoining this antitank trench to the rear, along the swampy tributary of the Moskva, was another zone (3), 1 kilometer deep, made up of wire obstacles. Then followed a tank trap (4) in the form of a deep antitank ditch several meters wide. The next defense zone (5) consisted of endless rows of chevaux-de-frise, made of sections of railroad rails welded together (figure 2). Only then were found bunkers (6) of all kinds, and field fortifications (7) as well as artillery emplacements (8).

Comment: In spite of the elaborate nature of this defense system, the Germans assert that it was successfully penetrated. However, the outcome of the operation indicates that the penetration was limited.



SYSTEMS OF DEFENSES BEFORE MOSCOW
8
7
6
5
4
Moskva
River
3
2
1
HIGHWAY TO MOSCOW

INFANTRY

14. GERMAN COMBAT EXPERIENCES IN RUSSIAN WOODED COUNTRY

In many respects, combat in woods is similar to that in towns. Some woods, owing to their location and size, are naturally strong defensive areas. The Germans, it is supposed, derived considerable experience in this kind of warfare during the fighting on the Eastern front. Some of these experiences, based on German sources, are recounted in the following paragraphs.

a. Characteristics

Training for fighting in wooded country not only improves self-confidence and ability for decisive action, but is at the same time good practice for fighting in darkness and smoke.

The Russians show extraordinary powers of resistance when fighting in marshy and wooded country. They make full use of their exceptional sense of direction and masterly camouflage. They use woods to a large extent, not only for approach, but also in defense, tending, in that latter case, to defend the edges of the wood strongly. The Russian does not give up easily, and therefore the attack in woods must be systematically carried out section by section. The enemy will cover trail crossings with heavy weapons. The difficulty of movement necessitates the allotment of heavy weapons and artillery to units at the start of an operation in order to avoid delays later on.

A coordinated fire plan for attack and defense is often impossible, and reliance must be put on coordinated infantry thrusts. Surprise is a more decisive factor in woods than in open country, and systematic preparation and silence in all movement are essentials.

It is easy in wood fighting to allow one's forces to be split up, especially when patrols, and flank and rear guards, have been detached. Every effort must therefore be made to keep one's forces intact. Movement should be made in deep formations.

A detailed plan must be drawn up, and when a departure from the original plan seems inevitable, permission from the next senior commander must be sought so that he can inform the supporting elements of the changed conditions and avoid any possible danger from one's own fire. (This departs from the modern practice in German tactics, which encourages flexibility of action among junior commanders, and must presumably apply only to the specific conditions of wood fighting).

The results of air reconnaissance are often inadequate, and the employment of numerous and strong fighting patrols is of increasing importance. Efficient signal communication cannot be too strongly stressed.

b. Reconnaissance

Surprise by the enemy must be countered by continual ground reconnaissance. Patrols should be sent to the flanks. Intervals should be sufficiently great (in thick woods, 150 yards) to prevent a patrol from hearing the noise of neighboring patrols, which might often lead to confusion and loss of direction.

The arms carried should include submachine guns, rifles (preferably automatic with telescopic sights), and plenty of egg grenades; machine guns are cumbersome. Stick grenades are unsuitable as they easily become lodged in branches. Egg grenades, on the other hand, break their way through. Steel helmets should be left behind; they impair hearing.

Tasks of patrols must include the following objectives:

Where is the enemy expected to appear?
Where is he?
Where are his flanks?
How far is he each side of the trails?
Where is his main line of resistance?
Which trails and roads does he use?

Ground reconnaissance must clarify the following:

Existing roads, trails and clearings, ditches, rivers, and bridges;
Condition of the woods and their undergrowth, such as thickness and height of trees, marshy ground, rises and dips in the ground;
Location of tree snipers.

Trails give valuable information as to the direction the enemy has taken. Branches broken off at about head height, axe marks on tree trunks, and bundles of leaves hanging in branches might be used to show the route taken by the enemy.

c. The March

Under difficult conditions the rate of march is sometimes as low as 2 to 3 miles a day. Engineers must be well forward, and special units for clearing and improving routes must be formed. The help of the local inhabitants as guides must be obtained when possible. Advance guards must be strong enough to envelop enemy forces which are likely to offer resistance along the line of march. Heavy weapons, artillery, headquarters, and signal detachments should also be well forward. Mechanized vehicles with infantry support will be used as protection where possible. Flank and rear guards must be lightly equipped to give them mobility. Antitank weapons and tank-destroying sections must be distributed along the column.

d. Approach

Leave the roads as soon as possible. The thicker the woods, the closer should be the formations. Moves must be made in bounds and covered as far as practicable by heavy weapons and artillery. It has proved worth while to have single rifle squads distributed forward and to the flanks for close-in security. When reaching clearings, trails, etc., and also when leaving woods, a halt should be made to enable patrols to make a careful reconnaissance in order to avoid surprise by ambush and tree snipers. Rifles, submachine guns, and machine guns must not be carried slung, but must be ready for immediate use.

e. Attack

(1) General

In order to effect surprise, feint attacks can often be usefully carried out in woods. Every effort must be made to effect a flanking movement, the enemy being held down frontally by the fire of heavy weapons while strong forces envelop the flanks.

Fire discipline is very important in wood fighting. Irregular, single bursts of rifle and machine-gun fire are of little use. The fire must be controlled in short and heavy bursts. A strong burst of fire has a big moral effect. When the attackers come under fire from the enemy, which will be at quite short range, it has been proved less costly if the attackers rush the intervening ground than if they take up positions and exchange fire. It is no use, after breaking into the enemy's position, to follow up with fire alone, as a withdrawal can easily be made under cover.

The enemy must be speedily reengaged, and given no respite. It must always be remembered that ammunition consumption in wood fighting is heavier than in the open.

(2) Attack against a Weak Opponent

Flanking movement is generally easily accomplished without great loss. Sound signals are best used, as visual signals are readily missed.

(3) Attack against a Strong Opponent

Assault troops armed with close combat weapons and supported by flamethrowers must break into the enemy's position and effect a narrow penetration. It will often pay to make a surprise breakthrough without first opening fire. Heavy mortars and single light infantry and antitank guns will generally be allotted to the rifle companies. Antitank shells can be used very effectively in woods. Numerous observers must be placed well forward to direct the artillery.

f. Clearing a Wood

Combing through woods over a wide area with intervals of a few yards be-

tween each man has been proved ineffectual, because there is always the risk that the enemy having concentrated his forces can easily break through the weak line. The rule must be to keep one's forces together and send in strong assault support from various directions with the aim of encircling the enemy. This must be the subject of very careful and coordinated planning on a time basis. Attempts to break out of the wood must be countered by covering the edges with fire from heavy weapons and artillery, as well as by the employment of tanks and assault guns.

g. Defense

To avoid being surprised there must be constant reconnaissance; it is wrong to wait for the enemy to approach under cover; it is right to search him out and destroy him wherever he is. The very mobility of the defense deceives the enemy as to one's strength and intentions. Reserves must be ready to make counterattacks. Woods offer numerous possibilities for obstacles in depth; these hold up the enemy or divert him to routes favoring defensive fire. If time is too short for construction of continuous defensive positions, every effort must be made to arrange strongpoints of resistance, with all-around defense if possible. These should be surrounded by mines. Weapons should be placed 30 to 50 yards behind the edge of the woods, so long as visibility is not impaired. Wood defense requires a large number of observation posts, and signal equipment must be obtained from the division signal unit for the necessary links. Trails must be cleared of dry wood and other material which causes noise. Wire must be anchored to the ground; otherwise, its removal with implements such as hay-forks is possible. Listening posts must be changed daily.

h. Training

The following points in training are particularly important:

(1) Individual

Silent movement; working forward in thick undergrowth; crawling in various types of woods; visual training and indication of targets; finding direction; marking routes, and recognition of enemy markings of routes; cover and camouflage; close combat and engaging tree snipers; antitank close combat in woods; tree observers; patrols; pickets; firing in woods.

(2) Heavy Weapons

Transporting heavy weapons; rapid emplacement; creating fields of fire; observation and keeping contact; reporting targets; fire coordination.

(3) Engineers

Building bridges and dams, and clearing paths and trails in marshy ground;

rapid removal of tree obstacles in depth; building wire and tree obstacles; building observation posts; preparing gun positions and making clearances in the field of fire.

(4) Formations

Formations for movement and fighting in woods; marching to the sides of trails and by night; movement by bounds; quick deployment; surprise with light and heavy weapons; attack on limited objectives, coming under enemy fire; break into enemy position, and quick exploitation of success; defense alarms; reserves counterattack; security at night.

15. SOME BRITISH OBSERVATIONS OF JAPANESE TACTICS

From a very recent British report, the following observations on Japanese tactics have been selected. Quite possibly, some or many of the details are already known to our troops, but there appears to be much of general interest in these notes. It is worthy of mention that the British are making use of our experience as we are of theirs.

* * *

a. A Hint about Pass Words

The old Japanese trick of using the language of our troops to try and discover our positions has again been used in Burma.

One voice was heard shouting in Bengali "Don't shoot, we are the--Rifles. Where are you?" On other occasions English and Urdu (a Hindu language) were used.

It is, however, generally quite simple to distinguish whether friend or foe is calling, as the Japanese find many of our words impossible to pronounce correctly.

The following short table indicates the manner in which the Japanese would pronounce certain groupings of English letters. Note that they substitute "r" for "l," "su" or "za" for "th," and "b" for "v."

Words employing any two or all of the letters would certainly be mispronounced by Japanese. It is useful to bear this in mind when formulating pass words.

English Letters	Japanese Phonetic Pronunciation
La	Rah (soft r)
Ly	Rye (soft r)
Th	Su (soft s as in "soft")
The	Za or Zeh
Very	Bedy (y like double "e" in "see")
Velvet	Berubet

b. Reconnaissance Methods

A number of Japanese documents from fighting areas show how the Japanese stress the importance of reconnaissance.

Scouts are instructed to sketch hostile dispostions from observation posts and to bring back their reports without taking any unnecessary risks. Urgent reports, it is stated, must be made by telephone or orally and afterwards confirmed by sketch maps. In reconnaissance much use is made of all available natives.

In New Guinea the primary task of reconnaissance was the pinpointing of positions: personal reconnaissance by officer patrols took place. Preparations for night attacks in Guadalcanal included the sending out of scouts "since enemy security during the night is not always sufficient." Officers were ordered to "study aerial photographs and reconnaissance reports in detail, remembering outstanding features in the area to be attacked."

c. Approach through Jungle

The following extracts from a divisional order secured in Guadalcanal illustrate the detailed precautions taken by the Japanese when approaching a combat area.

"Even though the march through dense forest at night is planned beforehand, there are naturally many occasions when maintenance of contact is difficult. For this reason, during movement at night lights should be used. It may be necessary to use glow worms taken from dead trees to maintain contact:

"If one man is ordered to carry out the work of cutting away the undergrowth through the dense forest, the march will be impossible. A squad of 30 men and an officer is necessary as a clearing squad under jungle conditions to keep the column moving.

"Contact in the forest must be maintained by the use of a small whistle, and it is very important not to shout. The enemy often sets up a microphone on elevated ground and directs his artillery fire when our position is known."

d. Camouflage

In certain instances, gun emplacements have been camouflaged by building up the sides of a gradual slope and coloring the whole position to correspond with the sand or soil surrounding it. The tone blending is complete, but the circular outline remains clearly visible. Overhead covering is not used on this type. In other types, overhead covers are used, the cover being a "flat" made up of a net interlaced with cut scrub. The position is none the less easily observed because of signs of activity on the trails and the tendency of the Japanese to cover only the area immediately over the gun. They also neglect to bridge the "slashed" area in the virgin scrub, which surrounds the emplacement.

In one area our troops found four well-camouflaged guns. Here, a net interlaced with garlands and strewn with small bushes to give relief was used to hide the guns. However, they were readily discernible on photographs because the camouflage did not form a complete cover. The ground surface could be seen, and the light sand, where the emplacement had been dug, revealed its position.

Dazzle painting is another form of camouflage used. The general procedure has been to paint the roof and sides with wavy zebra-like stripes of alternate light and dark colors. Usually, bands of dark and light stripes continue from the eaves, but some roofs are painted with a band of light and dark stripes up to the ridge, and with the contrasting colors from the ridge down to the opposite gutter. This latter method forms a distinct line of demarcation along the ridge of the roof and destroys the illusion. These bands do not average more than 10 feet wide, regardless of the length of the building. Another type of dazzle painting is to paint the roof and sides with spots of dark color on a light background, in a manner that can best be compared to the spots on a giraffe.

The Japanese have been relatively successful in hiding some objects by completely covering them with earth. They have guarded against detection by building a slope of low gradient, thereby achieving the minimum relief.

e. Defensive Bunkers

(1) General Remarks

The Japanese are evidently exponents of the theory that the construction of a defensive position involves a continual process of development. It is normal for a new defensive position first to take the form of a series of fox-holes, which are subsequently, if time and circumstances permit, linked together into a coordinated defense system. Such a position may well include still other fox-holes, which are difficult both to locate and to eliminate. The third stage of development takes the form of the construction of strongpoints, or "bunker" type earthworks as they have been called in New Guinea. These strongpoints, as seen in Burma, fall into two types, both of which are illustrated in the accompanying sketch.

(2) The Double-Bay Bunker

These are built in two sizes, 25 ft. by 15 ft., and 60 ft. by 40 ft. They consist of mounds of earth from 5 ft. to 12 ft. in height, with a rear entrance well recessed into the mound. Forward, a central, apparently solid, block projects to form two bays. These bays vary in size. The smaller-size earthworks form part of the main trench system, with which they are linked, but the large "bunkers" appear to be isolated.

(3) The Single-Bay Bunker

This consists of a roughly circular mound of earth about 25 ft. in diameter and 5 ft. high, with entrance at the rear, opening on to a crawl trench or the main trench system. In front is a firing-slit at, or slightly above, ground level, from 6 to 8 ft. long and about 1 1/2 to 2 ft. high. Inside there is presumably a timbered dugout partly below ground level.

Comment: Up to now these bunker strongpoints have been identified in Burma in beach defense positions only, though there seems no reason to think that they cannot be equally well employed elsewhere should any particular position warrant such a comparatively elaborate defense.

It appears that these defensive positions are normally occupied in the first instance by a platoon armed with their usual weapons--light machine guns, rifles, and grenade dischargers. A position covering a front of some 600 yards may seem a very large assignment for one platoon, but this wide dispersion seems to be standard Japanese practice in the defense.

In the later stages of development of a position, when the strongpoints have been constructed, the platoon is probably strengthened by detachments from the machine-gun company or battalion infantry gun platoon. They appear to use both the single- and double-bay bunkers as positions for their heavy machine guns. The double-bay type may also be used as covered emplacements for their anti-tank guns. This does not preclude the use of either type also as positions for the normal automatic weapons of the platoon.

16. JAPANESE TACTICS IN THE MILNE BAY OPERATIONS*

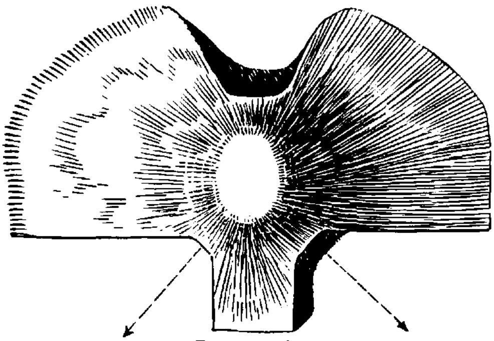
a. General

The present tactics and techniques of the Japanese have been developed as the result of combat experience against active enemies under varied conditions and over many types of terrain.

As is generally known now, the Japanese are cunning fighters, skilled in the use of ruse and deception. They are well trained in the tactics of infiltration,

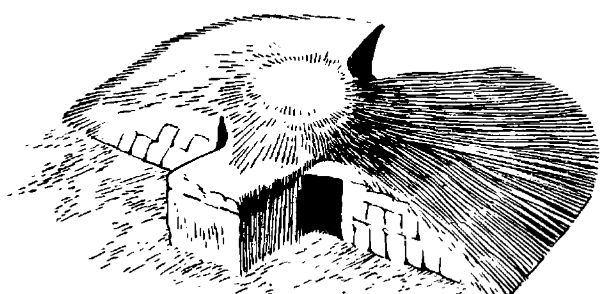
*Based on British report.

THE DOUBLE BAY "BUNKER"



Plan view

Front elevation

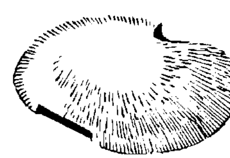


Oblique view

THE SINGLE BAY "BUNKER"

Plan view

Front elevation



Oblique view

especially in jungle and mountain country. Their favorite maneuver is the turning of an exposed flank. During the entire Milne Bay operation (see Tactical and Technical Trends, p. 28, No. 22 for previous reference to this operation), Allied flanks were never secure, because the Japanese had practically complete immunity by sea and so could make landings at any chosen point.

While it is true that the tactics employed at Milne Bay should be regarded as applicable to a particular terrain rather than as representing the normal situation in jungle warfare, yet the principles illustrated and the lessons learned are of general application.

b. Patrols

(1) Strength

From Japanese sources it is learned that in this operation the patrol strength for special tasks was one officer and six enlisted men, or one non-commissioned officer and three enlisted man. Normal night patrols numbered 18 men or more, while day patrols averaged from 6 to 10 men. In general, these patrols moved as a body and kept to the trails. Combat patrols were not employed by the Japanese for reconnaissance.

(2) Employment

Scouts made use of the thick jungle to approach our defense areas, or were left in position when the enemy withdrew from a night attack. In general, they would lie "doggo" and unobserved in order to get information to their troops. They allowed our patrols and working parties to pass unmolested.

c. Night Operations

The Japanese force relied almost entirely on night operations, for which it appeared to have been well trained.

There were no Japanese attacks by day and movement was limited. This might have been due to our complete command of the air. The main Japanese body rested by day with little regard for local security.

d. Approach March

During the approach march, the Japanese moved rapidly, in groups of 20 to 30, with little regard to flank protection. The main line of advance was the road or beach. Bodies of troops did not seem to have moved more than 300 yards from the road. A speed of movement was achieved which would have been impossible if an attempt was made to secure the flanks. Enemy troops talked a good deal during the approach march, but were careful about lights. Absolute silence was maintained just before the attack and while assembling.

e. Night attacks

During the assembly for the attack, Japanese troops tended to bunch up. Once the attack began, they made all the noise possible by firing mortars, grenades, and fire crackers, and by calling and whistling. This noise was made not only to draw our fire but also in an attempt to demoralize our troops and to encourage their own.

Night attacks were made on a small frontage, but mortars were fired well forward to the flanks to give an impression of a large force advancing on a wide front. The rear elements seemed to be more widely deployed for a probable flank envelopment.

When our troops opened fire, the Japanese tried to infiltrate through our flanks and rear. When in position, they attempted to rush our posts under cover of mortar fire and grenades.

f. Night Withdrawals

These night attacks were suddenly broken off before daylight. The Japanese withdrew again in chattering groups along the road. In two instances, the signal to withdraw was a bugle call. Snipers and observers in trees close to our main line of resistance and along trails were left behind as they withdrew. A great deal of equipment was abandoned, but no wounded were left.

g. Sniping and Field Craft

The Japanese used tree snipers to harass our troops during the day and interfere with the advance. Before opening fire the snipers would allow our troops to approach within a few yards, or to go past. These snipers cooperated with others hidden on the ground. When our troops exposed themselves to shoot at tree snipers, they drew fire from the ground. Other snipers lay hidden among their own dead and allowed our patrols and burial parties to go past before firing. The snipers' marksmanship was not as good as their fieldcraft.

The fieldcraft of these snipers was very good. They used foliage and body camouflage nets and secured themselves in the leafy tops of coconut palms and other trees. Their greenish uniform blended well with the vegetation. They were so well hidden that it was necessary to draw their fire in order to discover their position. Even then they were difficult to dislodge.

h. Defense

Japanese tactics in this action were mainly centered on attack. All defense positions were covered by a screen of snipers who were hard to deal with.

i. Infantry Cooperation with Tanks

At least two light tanks were used by the Japanese in this operation. Some machine gunners rode on the tanks or followed close behind. The glare of the headlamps prevented our troops from seeing these troops. In defiles, other infantry parties preceded the tanks to deal with antitank guns lying in ambush.

j. Deception

In addition to skillful fieldcraft, the Japanese made free use of English phrases in ruses to draw fire. Some were well chosen to give the impression that bodies of our troops were approaching the position; examples were "Do not fire, troops coming in," etc. However, a few of these expressions were quite inappropriate--as "Good morning" in the middle of the night, etc.

k. Recommendations by Brigade* Commanders

(1) Communications

Jungle fighting presents great difficulties for signal communication. Visual signaling is often impossible. To counteract this situation, it was recommended that a large and immediate reserve of wire and spare telephones be made available for issue to battalions in this type of operation. In all cases where lines and telephones were available, signal communication was maintained in the heaviest undergrowth.

(2) Transport

Only vehicles with high clearance and 4-wheel drives are recommended for this type of operation; also, that each company (if possible each platoon) be equipped with a light 2-wheel cart similar to the type captured from the Japanese. These carts are invaluable for rapid transport of mortar bombs, supplies, and ammunition, and in some cases for the evacuation of the wounded.

(3) Clothing

Recommendation was made that all enlisted men be issued capes equipped with cross-straps in place of the present type, which is a sort of cape thrown over the shoulders with a series of buttons down the front. It is awkward to handle, especially if the soldier is called upon to use his rifle.

(4) Ordnance

In place of drum magazines for Thompson submachine guns, it was proposed that the box type magazine be carried. Bayonets should be sharpened to a cutting edge to assist in the quick clearance of undergrowth. It was recommended that Royal Australian Air Force type signal pistols and cart-

*Brigade approximates U.S. infantry regiment.

ridges be issued, so that a more economical signal ammunition code would be established for the recognition of troops in forward areas, instead of the method involving considerable expenditure of Very cartridges. Finally, it was recommended that guns place one round of smoke on each side of the target to indicate positions to aircraft for bombing and strafing. This method was tried, and the round of smoke was placed on each side of the target according to the direction of the wind. This proved very effective, as the smoke drifted very slowly, hung about the tops of the trees, and was easily sighted by Allied planes.

MEDICAL

17. ATABRINE FOR MALARIA

Contrary to current popular impression, atabrine is not a brand-new drug for the treatment of malaria (See Tactical and Technical Trends, No. 20, p. 23). It was developed by the German dye industry some 12 years ago and has been in use for more than a decade. Tens of thousands of cases of malaria were treated with atabrine before the present war began. Careful research and extensive field tests were made to compare its effectiveness with that of quinine. It is generally agreed that atabrine is a good antimalarial drug and has no serious toxic effects. Like quinine it does not always cure malaria in one course of treatment, and also like quinine, it does not prevent infection when used as a prophylactic. Both drugs, however, given in small doses, are very useful in suppressing clinical symptoms, especially under emergency conditions such as a period of combat, when men must be kept on their feet in spite of malaria infection.

When the Japanese occupied the Dutch East Indies and thereby captured the source for more than 90 percent of the world's supply of quinine, it became necessary to conserve the present stock of quinine in order that it may continue to be available for the small proportion of malaria cases which require special treatment. To this end it has become the policy of the Army and the Navy, as well as our Allies, to employ atabrine both for suppressive and curative treatment wherever possible. In this connection it should be pointed out that atabrine is used both by the Japanese and by the Germans for the same purposes.

Atabrine is a yellow dye. Its continued use therefore usually causes a yellow coloring of the skin. This has no harmful effects, however, and soon disappears when the drug is discontinued. In a small minority of cases, atabrine may occasionally cause nausea and vomiting. These symptoms are seldom serious and can usually be avoided by taking the drug only after meals. The vast majority of people take atabrine without any unpleasant effects whatsoever.

With American and Allied armies operating in many of the most malarious countries in the world, vast quantities of antimalarial drugs are required. Since new sources of the cinchona bark from which quinine is extracted are meager, it is indeed fortunate that the synthetic drug, atabrine, is available. Without a sub-

stitute for quinine it would be impossible to carry out military operations in most parts of the tropics. Facilities for the manufacture of atabrine have been greatly expanded, and supplies for the armed forces are adequate. On the whole, atabrine is just as effective for the suppression and treatment of malaria as is quinine. Thus, the loss of most of the world's supply of quinine to the Japanese has not proved to be a serious handicap to the health of our fighting forces.

ORDNANCE

18. ITALIAN 75/27 HE FRAGMENTATION SHELL

The unusual feature of this ammunition is a "fragmentation piece," or segmented metal cylinder filled with TNT. The detonation of the shell is intended to break up the cylinder into small squares, thereby augmenting the antipersonnel effect. The shell body is of carbon steel, probably of low tensile strength, and is punched and drawn with a solid base, and the cavity is machined. There is a single copper rotating band. The nose, fuze adapter, and fragmentation piece are machined castings in gray cast-iron.

The shell may be identified by its specially processed gray surface with a 15-mm (.58-inch) light blue band, 20 mm (.79 inch) forward of the rotating band. An examination of the shell produces the following descriptive data:

Weight of shell body	6.98 lb	Length of shell body	7.97 in
Weight of nose fuze adaptor	1.87 lb	Length of nose fuze adaptor	2.16 in
Weight of fragmentation piece	3.85 lb	Length of fragmentation piece	6.46 in
Total weight (unfilled, unfuzed)	12.7 lb	Length of shell, unfuzed	9.25 in

Length of shell in rear of Rotating band 1.48 in

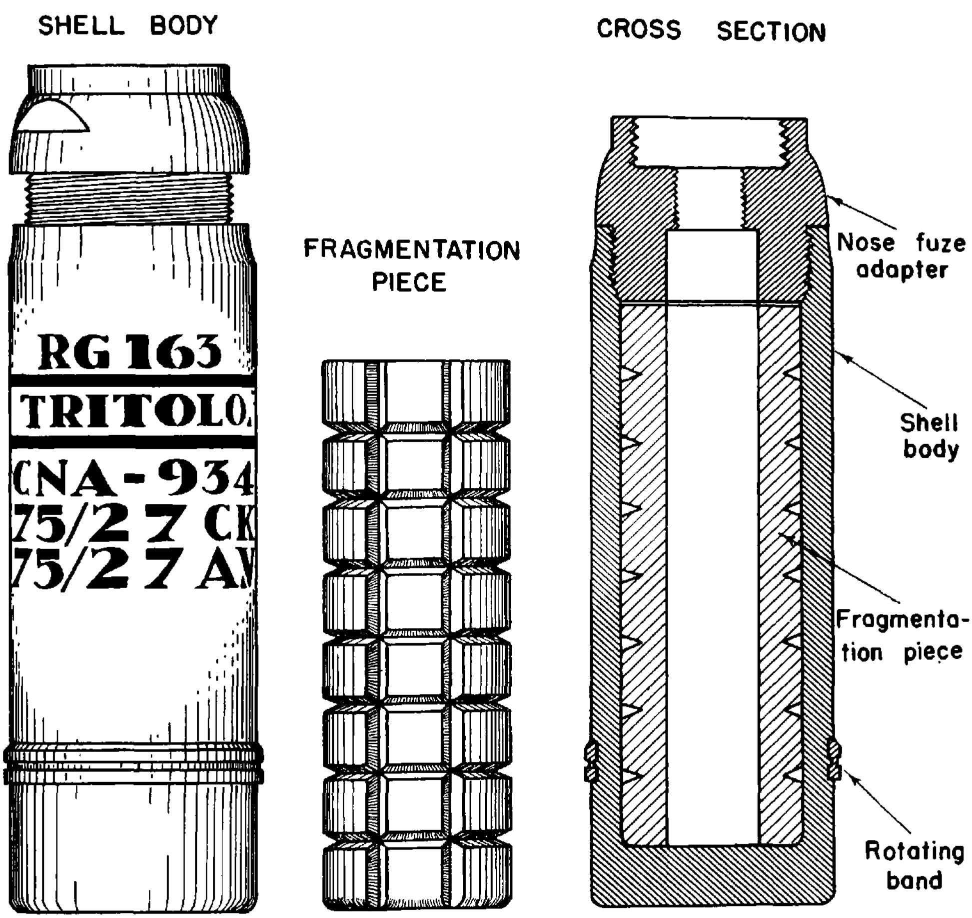
19. ITALIAN 8-MM BREDA MEDIUM MACHINE GUN, MODEL 38*

This weapon is a tank-pattern machine gun, and is fitted as standard in the following Italian tanks: the 6 1/2-ton Light (1940), the 11-ton Medium (1939), and the 13-ton Medium (1940).

The Italians have also adapted it for use as an infantry machine gun. For this purpose the gun is mounted on a machine-gun tripod (as shown in an accompanying sketch) by means of an adapter, and is fitted with a temporary rear sight on the right of the body and a temporary front sight on the right of the barrel at the muzzle. These temporary open sights take the place of the optical sight used when the gun is tank-mounted.

The gun is also sometimes fitted with a "cartwheel"-type AA sight and

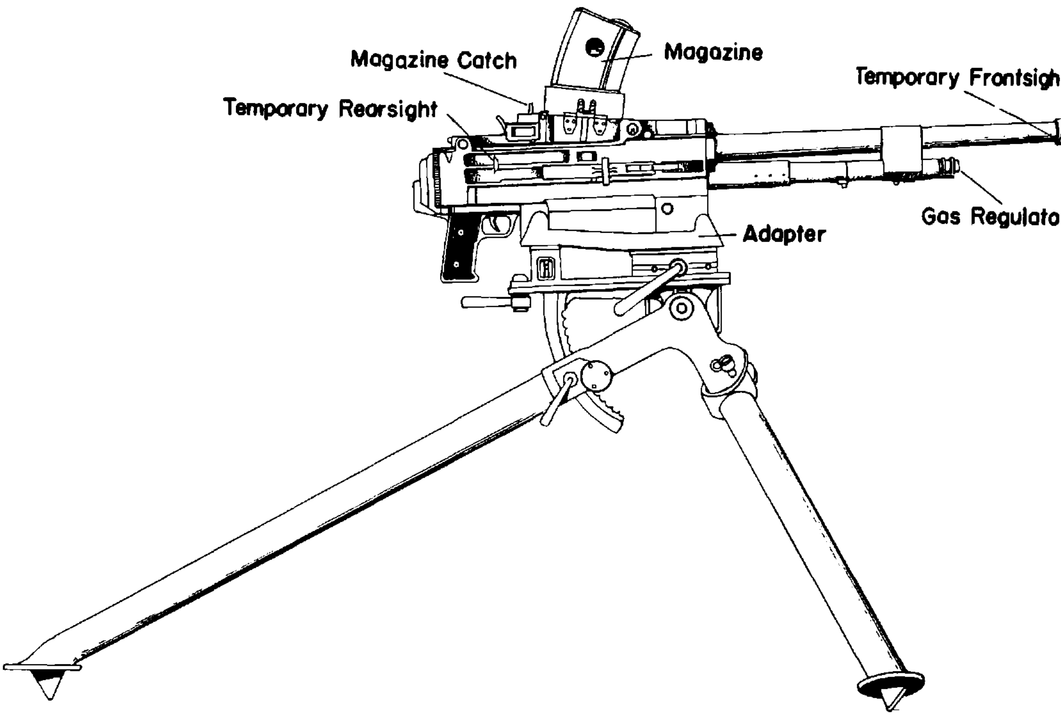
*Extracted from a recent Aberdeen Proving Ground report.



ITALIAN FRAGMENTATION SHELL

arranged either alone or with another "twin" gun on an AA mounting.

The gun is air-cooled, gas-operated, and magazine-fed, and has a quick-change barrel. Its operational features are simple, and it is extremely easy to field-strip or disassemble completely. The barrel is sufficiently heavy (9 7/8 pounds) to enable it to fire a large number of rounds in quick succession without overheating.

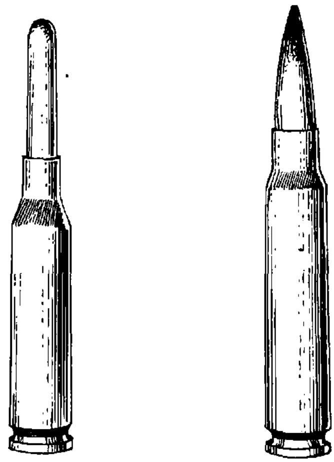


The following are some of the characteristics of this weapon:

Weight of gun	33 7/8 lbs
Weight of barrel	9 7/8 lbs
Length of gun (over all)	35 1/2 in
Length of barrel	23 in
Feeding device	24-round vertical box magazine
Maximum (cyclic) rate of fire*	600 rpm
System of operation	Gas piston
Rifling - uniform, RH twist	Concentric
No. of grooves	4
Cooling system	Air

*This information has not been checked by U.S. test.

6.5 MM 8 MM



With ball ammunition, the maximum accuracy range is 800 to 1,000 yards, and the muzzle velocity is estimated to be about 2,600 feet per second. In addition to ball, the following types of ammunition are known to exist:

Armor-piercing	Green tipped
Armor-piercing tracer	Red tipped
Incendiary	Blue tipped
Tracer	Red or green tipped

It is believed that this ammunition can be used only in automatic weapons. Of the various standard Italian automatic weapons, in addition to this Breda 38, two other 8-mm medium machine guns, the model 35 Fiat (Revelli) and the model 37 Breda*, are known to use this 8-mm ammunition. The ammunition cannot be used in the standard Italian infantry rifle, carbine, and light machine guns, the caliber of which is 6.5 mm, nor can it be used in the Italian 7.35-mm Breda 38 light machine gun** or the German 7.92-mm weapons. For a comparison of the external appearance of the 8-mm and 6.5-mm ammunition, see accompanying sketch.

SIGNAL CORPS

20. RADIO COMMUNICATION FOR GERMAN 105-MM GUN BATTERY

Recent information gathered from German sources refers to the radio facilities that are part of the equipment of these batteries. The equipment consists of two 30-watt transmitters, one mounted on an armored reconnaissance car, the other, on a truck when on the march, or near battery headquarters while stationary. In addition a battery has at least three portable transceivers known as "Fritz." This is a two-man outfit; one carries the transceiver, the other, the accessories, batteries, and antenna. Each radio set has two microphones, throat and mouth; however, the latter are preferred. The "Fritz" radio set is not a walkie-talkie and must be set up for operation. It has a range of about 5.5 miles. The battery also has direction-finding equipment.

a. Tactical Use of the Radio Equipment

The two 30-watt sets are only used when on the march. Then the armored reconnaissance car is sent out ahead and keeps in contact with the battery by radio. When in stationary position, it is stated that the 30-watt equipment was

*See Tactical and Technical Trends, No. 23, p. 25 for a description of this gun.
**This weapon has not been encountered in combat.

not used and that no radio net existed among the various batteries; only telephone was used.

Two advanced observation posts are set up by each battery. The forward advanced post is equipped with telephone and radio, the radio being used only as a standby. The forward observation post reports directly to the battery, and only in emergencies will it communicate with the other observer. Direction-finding equipment is theoretically to be used to locate enemy stations, but was also used in the Libyan desert by the observers to orient themselves in case they got lost or detached from their battery. Under ordinary circumstances, so it appeared, the direction-finding device was little used.

b. Use of Codes

Codes are used by the observers. The radio-station call signs and frequencies are changed every 4 hours. The call signs are made up of letters and numbers. The signal operation instructions concerning call signs and frequencies are issued every 3 days. No authenticators are used. It is thought that changing call signs and frequencies every 4 hours is sufficient signal security. All messages transmitted to the battery headquarters and all orders to observers are sent in a prearranged code. All points in view of the observer, and the area in general, have previously been mapped and designated points given code numbers. As a result, the observer gives all points mentioned in a report in code. Reference was here made to the fact that the sending of false messages by enemy troops either to the observer or to battery headquarters would be difficult. Only fire commands are given in the clear; otherwise, code is strictly used. The only exception to this is the case where the officer originating the message signs a statement that he wants it sent in the clear.

The statement was made that considerable trouble was experienced because the German radio equipment was not watertight. It was felt the British equipment was superior to the German in this respect. It usually took 3 days to get a set back when it was sent in for repairs. Other than the equipment getting waterlogged, no troubles were encountered.

GENERAL

21. PRISONERS OF WAR USED FOR PROPAGANDA

According to a captured South African recently released by the Germans, PWs are invited to speak over the German radio. It is thought that involuntary recordings of interviews with PWs have been made for propaganda purposes. A member of a German propaganda company circulates among the PWs asking them to repeat their name and rank and state how they have been treated. The propagandist has been observed to carry a mysterious little box, and it is believed that he recorded the answers by pressing a button on the box. The result in many cases provided a continuous broadcast of short interviews, featured by the German radio.

22. NOTES ON ITALIAN ORGANIZATION

a. General

It should be appreciated in connection with all Italian tables of organization that, although rigid in intention, they are continuously changeable in fact. At increasingly frequent intervals, regardless of the fact that the last promulgated new establishment has not yet been brought wholly into effect, the Italian War Office produces another organization which is itself in most cases fated to be realized only on paper. The intentions, under the ever greater influence of German tactical ideas, are usually good, but owing to lack of the necessary equipment and to the usual bureaucratic confusion the army is generally content with an approximation of the effect intended.

b. Divisional Organization

The main point of interest about Italian organization is that the infantry division has only two infantry regiments. Reorganization in the so-called "Binaria" division (organization begun in 1926 and largely completed by 1935) was intended for the kind of warfare in which, on the official theory, Italy would be exclusively engaged--a war of rapid movement and quick decision. This Italian hope, based mainly on the fact that the Italian resources are insufficient for a long war, has not been fulfilled, and in practice the system has been found to have the serious defect that it leaves the divisional commander no reserve. Particularly in the hard-fought Albanian campaign was it noted that after a division had been involved in active operations for any time, and sometimes even after only a week, it had to be withdrawn from the line to refit. In some cases where a withdrawal was impossible, elements of one division were simply incorporated in another; this has also occurred in Africa in the case of the Bologna and Sabrata divisions. All Italian divisions in Africa were drastically reorganized in the spring of 1942. The main features of the reorganization are increased artillery and the inclusion of support and antitank weapons within the framework of infantry units.

c. "Groups"

Another feature of Italian organization which is worthy of mention is the passion for forming "raggruppamenti," or groups. This is a method of providing, for instance, a headquarters and administrative detachment for various independent batteries of artillery which are meant to operate together. Another example is provided by such formations as the "Raggruppamento Celere Africa Settentrionale" or "RACAS" (North Africa Mobile Group) which is a force of armored cars, mechanised infantry, portee guns and light tanks. The use of "raggruppamenti" is evidence of the Italian bent for improvisation and the desire to break the back of a rigid system of tables of organization.

23. EXPERIENCE IN RUSSIA MODIFIES GERMAN TRAINING METHODS

The following material is taken from a training circular issued by the German High Command. Some of the points made illustrate the influence of the Russian Campaign on German training methods.

*   *   *

a. General

(1) It is very important to note that battle conditions will often not be as laid down in the text books, and that therefore, junior commanders must learn to be adaptable.

(2) There is great need for more practice and training in patrol activity.

(3) When organizing refresher courses behind the lines, it is not sufficient to work out a training program allotting certain periods for certain general subjects. It is necessary to make quite sure in detail what is to be taught within each period.

(4) Men must gain complete confidence in their weapons. They must be taught not only to shoot, but also to know their weapons and prevent stoppages. Firing at dusk and at dawn, and close combat, must be practiced.

(5) Infantry must be able to lift and lay mines, and to carry out engineer jobs independent of help from the engineers.

(6) It is important that training should also be carried out at night. Camouflage and digging-in must be intensively taught.

(7) A rapid change from attack to defence and vice-versa must be possible.

(8) Infantry must be taught to rely on their own weapons in taking gun positions, concrete emplacements, and fortified houses, and not to depend solely on the heavy weapons to destroy these points of resistance.

(9) Commanders must see that troops are instructed in the use of captured weapons.

b. Infantry Training in the Field

Time will generally be very short. Training will be made more difficult by lack of experienced instructors. New drafts must at the same time be incorporated in the fighting troops. It is necessary therefore to include only what is essential for the next battle. Subjects that cannot be taken up except in long

courses must be omitted. Troops will be mainly trained in the attack.

The following factors will influence the training program:

(1) Personnel (i.e., with regard to the physical and mental state of the troops; the state of training; the supply of instructors and personnel experienced in battle; and the number and quality of reinforcements); (2) Equipment (i.e., with regard to the condition of equipment, including motor transport, repair and maintenance facilities, and facilities for completion of equipment); (3) Billeting conditions; (4) Weather; (5) Leave; (6) Special missions during the training period (security duties, guerilla hunting, etc.); (7) Probable future employment in battle.

c. Training the Rifle Company

(1) This training will concentrate on combat training and marksmanship under battle conditions. Each man must be allowed to get on as fast and as far as his capabilities let him. In this way the company commander will form a reserve of good shots, and the competitive spirit will lead each man to improve his shooting. The best shots might be rewarded with telescopic rifles. Phases of the attack from 800 yards to the final breakthrough will be practiced. This is the only way to give replacements any idea of the battle conditions they will meet.

(2) Battle Training

Battle training is a preparation for battle firing, and therefore weapon instruction is a necessary preliminary. Special attention must be paid to digging in, which must become as automatic as parade ground drill. If 4 weeks are available for training, a number of combat exercises and practice shoots will be carried out in gas masks.

(3) Physical Training

Physical training, such as obstacle races, grenade-throwing, short and medium distance running races (some of which can be run in full equipment), is a preparation for battle training, in-fighting, and therefore battle itself. Physical training and games should not be omitted even though time is short.

(4) Lectures

Lectures will be cut down to essentials. Engagements in which the company has taken part will be used instead of lectures in general tactics. The chief usefulness of talks is in the raising of morale, and in the discussion of current affairs and of the meaning and the ideals of this war.

(5) Indoctrination

Periods are devoted to National-Socialist subjects such as "Mein Kampf,"

"German Lebensraum " ("living room"), "Total War," the "New Order for Europe," and "No Sacrifice is Senseless." Other time is given to explanation of the catchwords "Plutocrats," "Jewish Disruption," and "Herrentum" (the German Master Race), also of the characteristics of our Allies, rumors and whispering campaigns as enemy weapons, behaviour toward inhabitants of occupied territory, peculiarities of winter warfare, security, and defense on a wide front.

(6) Inspections

Inspections will concern only weapons and equipment used in battle, if time is short. Clothing and the full scale of equipment will be inspected only if there is plenty of time to put everything in order. Care of boots is as important as care of weapons.

(7) Platoon Commanders

Platoon commanders will be fully occupied in training their units, and their own further training in a four weeks' course will be limited to urgent subjects, such as giving commands, etc. Company commanders must make every effort to get platoon commanders together at least twice a week, not only to discuss past training but to prepare for the future as well. Training will be made easier if it is made clear which tasks have been satisfactorily accomplished and which have not, and if training objectives for the coming week are clearly laid down.

If the further training of platoon commanders cannot be satisfactorily carried out within the company, then battalions or regiments will arrange junior leaders' courses. Fresh platoon commanders should be taught not only the spade work of platoon leading, but also the technique of cooperation with the heavy weapons in ample time to pass it on to their units.

d. Heavy Machine-Gun and Mortar Platoons

Training will be concentrated on the crews. Special attention will be paid to the following points:

(1) Firing, and observation exercises on the black-board and sandtable;
(2) Giving of fire orders;
(3) Fire coordination between two sections;
(4) Locating the target.

e. Infantry Cannon Company

As with heavy machine-gun and mortar platoons, attention will be paid to the following additional points:

(1) Knowledge of essential terms;
(2) Quick giving of fire commands from observation;
(3) Forward OP shooting;
(4) Observation and appreciation of terrain;
(5) Practice of fire direction with companies and platoons.

f. The Antitank Platoon

The object of training is to produce reliabl[illegible] on the gun. Firing and aiming are the chief points.

Aiming exercises will be held for a short period each day. Manipulation of the sight, target-finding, and changing targets and sights are most important in these exercises. Success will be achieved only by constant practice until the man is completely accustomed to his weapon. Accuracy is always more important than speed.

Target practice will always have a definite purpose, for example, shifting aim from one stationary tank to another at the same range. Even if ammunition is short, target practice is still possible. More value will always be put on the number of targets being hit than on the number of hits on one target. The man must be trained to find the vulnerable point on a tank.

SECTION II

TACTICS OF STREET FIGHTING ON THE RUSSIAN FRONT

TACTICS OF STREET FIGHTING ON THE RUSSIAN FRONT

In the Battle of France street fighting played but a small part, since at no time were the Germans forced to assault an important town or city against prepared and determined resistance. Operations in North Africa have not involved street fighting on an appreciable scale. However, the story is different on the Eastern Front. The fact is that this type of fighting has been one of the significant features of operations on the Russian front since the winter of 1941-42, and it may well prove of major importance in possible future operations in Western Europe with its many cities and towns.

With a few exceptions, such as the defense of Sevastopol and Stalingrad, the importance of street fighting in centers of population on the Russian front appears to have been largely overlooked. The following British report on street fighting on this front is therefore of interest. This report is felt to be reliable and to present a good analysis of the tactical principles involved.

* * *

a. Strategic Importance of Town Defense in Russia

Fighting for, and inside, towns and villages on the Eastern Front has developed to a point where it has become of primary strategic importance in certain phases of the campaign.

(1) Early Period: Failure to Defend Towns

During the summer and autumn campaigns of 1941, fighting inside towns and villages did not play an important role in operations. Although the Russians did put up strong resistance in and around certain key towns, like Minsk and Smolensk, on the whole the German strategy of deep and rapid encirclement forced the Russians to abandon valuable towns in an attempt to extricate their armies. Certain cities were defended with great determination, namely, Odessa, Leningrad, and Moscow - but in each case all the fighting took place at their approaches.

(2) Later Period: Towns Are Defended

(a) First Phase: German Defense of Towns

The first phase of the campaign in which street fighting became important was during the Russian offensive in the winter of 1941-42, when the Germans stemmed the Russian advance by their determined defense of key towns and villages along the whole front. The tactical setting for this period of fighting was largely determined by the peculiar climatic conditions, in that an exceptionally cold winter and double the normal depth of snow denied to the Russians all freedom of maneuver and imposed on their troops a tremendous degree of hardship. The Germans were able to keep relatively warm in centers of population and to concentrate on the defense of the main approaches, and resorted to stubborn and

costly street fighting whenever the Russians did manage to break into a town or village.

(b) Second Phase: Russian Defense of Towns

The second phase of important street fighting was during the latter period of the Russian retreat in the summer and autumn of 1942 in southern Russia and Caucasia. Throughout July and in August, the Germans had advanced rapidly and had overwhelmed Russian resistance in some sectors by local air and tank supremacy. The Russians, at first, attempted to stop the Germans by getting off the main routes of German advance and striking at their lines of communication and supply, but this only interfered with enemy progress and did not stem his advance.

The Soviet High Command then issued strict orders that all withdrawals were to stop and every town and village must be defended street by street and house by house whether it was surrounded or not. This policy was put into effect with determination and ruthlessness, and achieved virtual stabilization of the whole front toward the end of August and throughout September, October, and November. This, in spite of the fact that in the steppe-type of country in southern Russia and north Caucasia the Germans had every facility to maneuver around centers of population. However, the determined defense in depth of all key points on main lines of communication made a sustained offensive by the enemy extremely difficult. The Russians were told to fight in towns even partially destroyed by aerial bombardment, and were taught to appreciate the tactical advantage of fighting in ruins.

(c) Third Phase: Stalingrad

The third phase in the development of the tactics of street fighting centers around the Russian defense of the city of Stalingrad; this operation was of the utmost significance to the whole course of the campaign on the Eastern Front and raised the tactics of street fighting to a level of importance never before envisaged. In this case, determined street fighting inside a large and unfortified city enabled the Russians to deny to the enemy one of the principal strategic goals of his summer campaign--the cutting of Russian communications along the Volga River.

b. First Phase--January - April 1942

(1) German System of Defense

Invariably the Germans prepare a town or village, likely to be attacked, for all-around defense. There is usually a belt of field fortifications outside the populated center, with ditches, minefields and other antitank obstacles protecting all approaches, every obstacle being covered by fire according to a well coordinated fire plan. Antitank weapons and obstacles are generally concentrated along the main avenues of probable tank approach, usually in the outskirts of the town or village.

The populated center itself is fortified according to a carefully designed plan, with emphasis laid on the importance of the element of surprise in all street fighting. Certain buildings are transformed into fortified strongholds, and several such building, capable of mutual fire support, form a defense area. Streets and houses which are outside these zones are covered by small-arms fire.

The ground floor of the fortified point is usually reserved for heavy weapons: artillery guns, antitank guns, and mortars. Sometimes tanks are placed in ambush inside barns or buildings, or partly dug in along the outskirts of the town where they might be least expected and, generally, covering the approaches to a fortified zone.

Heavy and light automatic weapons, snipers, and grenade-throwers are dispersed on the upper floors and on roof tops.

Artillery and mortars are also emplaced in parks, gardens, and courtyards and are more effective in repelling tanks than in close fighting.

If one or two buildings of a fortified zone are lost, the Germans attempt to counterattack vigorously before the enemy has time to consolidate his position.

(2) Russian Methods of Attack

(a) Preparation

Through costly experience the Russians learned that it is "the surprise nature of enemy fire in street fighting that has the deadliest effect," and that it is "often more difficult to find out where the enemy strongpoints are than it is to reduce them after they have been discovered"

Hence, the first prerequisite of a successful attack on a town or village according to Russian teaching is to determine the plan of enemy defense in detail, and to prepare a coordinated plan of attack, also in meticulous detail.

Therefore, the Russians insist on the value of detailed intelligence, which must aim not only at locating the fortified zones in the town, but also determining the defensive fire plan and locating the principal weapons. The importance of discovering means of approach to the fortified zones which will afford the best cover is equally stressed.

If all this cannot be established from intelligence sources, thorough reconnaissance and even reconnaissance in force to draw enemy fire is recommended. A detailed plan of the town or village is drawn, if one does not exist, and the probable enemy system of defense is sketched in. Then the plan of attack is worked out in detail.

(b) The Attack

(1) The Approach

The Russians stress the importance of surprise. If reconnaissance has been thorough or local guides are available, they prefer to attack by night. If possible, the attack is carried out by simultaneous thrusts from different directions. A feint is made generally to pin down the main antitank weapons. Although the objective may be surrounded prior to the attack, an avenue of retreat is left to the enemy, for experience has taught that cornered Germans fight desperately and that reducing fortified buildings is more expensive in casualties than is fighting in the open. Therefore, the attempt is made to force the enemy to retreat after a number of strongholds are taken and after the probable line of retreat is ambushed.

The Russians usually employed tanks in attacking villages, but used them sparingly, and often to pin down the main defensive weapons rather than to rush the defenses and take part in street fighting. Often the tanks are thrown in from an entirely different direction from the main infantry attack, but the importance of coordinating and timing these various blows is always stressed.

Close artillery and mortar support is insisted upon. A preliminary bombardment or creeping barrage to cover the approach is not usually necessary. The main thing is to plan and coordinate artillery and heavy mortar fire with the action of other arms and, in the initial stages, attempt to distract or deceive the enemy in order to effect the maximum surprise.

(2) Fighting to Reduce Strongholds

For fighting inside villages and towns the Russians rely principally on infantrymen armed with submachine guns, hand grenades, and bottles containing an incendiary mixture. Although the importance of training all infantry units in the art of street fighting is continually stressed, it is considered advisable to train and equip special detachments of assault troops for this task. It is not known how these groups are organized and whether each infantry battalion, regiment, or division has such detachments. It is known that each detachment is subdivided into a reconnaissance force and a main body. The reconnaissance detachment ascertains the best lines of approach and the cover which will enable the assaulting forces to approach their objective. The main body specializes in assault tactics and in hand-to-hand fighting.

The assault troops are taught to avoid advancing along streets or across squares. They must find their way to their objective by using back yards, fences, and lanes, and even by making their way from house to house, breaking through walls or moving from roof to roof if necessary.

The objective of an assault group should be to isolate and reduce a group of fortified buildings which compose a stronghold, and then go on to the next objective if necessary.

The importance of effective artillery support is stressed, but the difficulty of providing it is fully realized. The following procedure is recommended. Before the attack the infantry and artillery commander agree on a preliminary, definite, and simple plan of artillery support and establish a number of Very light signals, preferably, to indicate the progress of the attack.

On the other hand, it is the duty of artillery and mortar commanders to keep in the closest possible touch with the assaulting troops and to use their initiative in giving them close support wherever circumstances permit. A proportion of guns is actually moved forward to take on targets over open sights and to take part in street fighting.

(3) Consolidation to Repel Counterattacks

The Russians have learned from experience that the German is a skillful and dangerous opponent as long as he can keep his enemy at a distance by effective fire, but that he dislikes hand-to-hand fighting. Thus if the ground floor of a building is captured, there is usually no difficulty in clearing the rest of the house, but if a strongpoint is lost and the Germans have been forced to withdraw by hand-to-hand fighting, they usually stage an immediate and determined counterattack from a new direction.

Hence the importance is stressed of mopping up the ground taken, clearing it of booby traps and mines, and fortifying it against counterattacks as quickly as possible.

It is usual to assign the mission of fortifying and garrisoning a captured stronghold to a specially trained group forming part of the assault detachment.

c. Second Phase--August - November 1942

(1) German Method of Attack

The German methods of attack on towns and villages along their line of advance in southern Russian and Caucasia were radically different from the Russian methods under conditions of winter warfare.

Whenever the Germans expected to meet Russian resistance at a key point,they preferred to disorganize the defense by terrific aerial bombardment and rushing the defenses in their stride by a massed tank attack. Their local air supremacy and speed of advance, and the lack of natural obstacles, contributed to the surprise of such an onslaught.

(2) Russian System of Defense

The Russians gradually developed the following means of combating the German blitz tactics:

(a) To prevent the enemy from rushing the town defenses with tanks, a belt of defensive works was constructed in length outside the town. The depth and intricacy of these defenses depended on the garrison available for their defense.

(b) Inside the town, houses are reinforced and organized for defense in groups, as on the German pattern, with artillery emplaced on ground floors, in barns, squares, and parks.

(c) Particular attention is paid to antitank defenses. The Russians insist that tank obstacles to be effective must be planned with ingenuity and cunning. An ordinary tank barrier covered by fire is of little effect. The object should be to erect tank obstacles and traps so as to force the tanks to hesitate or turn and be taken by surprise. For instance, if along the probable avenue of tank approach obstacles are erected in the form of a labyrinth which would force the tanks to maneuver around and through the obstacles, this would allow the garrison to deal with the tanks effectively both by well-concealed antitank guns and rifles and by bundles of hand grenades and incendiary bottles.

(d) The principal lesson which the Russian Command had to teach their troops was that a town or village largely burnt down or even destroyed by preliminary air attacks, was even more suited to prolonged and stubborn defense than one with all its buildings intact.

The troops are taught to improvise fortified nests among ruins and charred remains of houses as quickly as possible, and to provide a number of alternative sites, all interconnected by a system of deep trenches. The debris offers greater opportunities for camouflage, surprise, and ambush than do standing buildings, is not as likely to be affected by subsequent bombardment, and is not vulnerable to incendiary attack.

(e) After the enemy has penetrated the area of the town or village, the importance of surprise counterattacks, when and where he least expects them, is stressed. In order to achieve this, it is important not to give away one's position or fire plan by movement or desultory firing; hence, practically all essential movement is restricted to the night. It is then that supplies and ammunition are brought up and the wounded evacuated.

(f) In preparing fortified positions the importance of eliminating all dead space is stressed. This can be best achieved by enfilading fire and by having mobile groups armed with submachine guns make use of available or improvised cover to attack enemy assault groups in flank and rear. The Russians make excellent use of snipers whose special task is to pick off officers and NCO's. The Germans have suffered heavy casualties among artillery forward observers, who keep in the vanguard of the assault to control the supporting artillery fire more effectively.

(g) It is never advisable to erect tank obstacles or barricades in front of firing points, because the enemy expects it and it is only likely to draw his fire.

d. Third Phase--Defense of Stalingrad

Street fighting tactics in the fighting at Stalingrad (August 26 - November 23) were on the whole no different from those outlined for phase two - both with regard to the methods of German attack or Russian defense - but the scope, intensity, and versatility of these tactics have not been paralleled in this war.

Before even reaching the city's outer defenses, which had been improvised apparently in haste and probably consisted of ordinary field defenses, the Germans pulverized Stalingrad by continuous aerial bombardment. Then followed repeated assaults supported by great numbers of tanks. This is how a German officer described these first assaults on Stalingrad:

> "The attacking German troops move forward behind tanks and assault guns, sweep away barricades with gun fire, knock holes into house-walls, and crush down wire obstacles. Guns and mortars batter concealed positions, antitank guns cover the side streets against possible flanking operations by tanks, antiaircraft guns are ready to meet attacking aircraft. Low-flying aircraft and Stukas attack the rear sections of resistance in the inner town, and the supply points and routes inside the town. Machine guns engage snipers on the roofs. Covered thus, infantry and engineer assault detachments, keeping close to the walls, advance over the wreckage from street to street, break down blocked doors and cellar windows with explosive charges and grenades, smoke out the less accessible corners with flame-throwers, and comb houses from ground floor to roof. In all this, they have frequently to engage the enemy in hand-to-hand fighting."

These assaults failed to make much progress, partly due to the great quantity of artillery concentrated by the Russians, and partly due to the way in which the large number of reinforced concrete and stone buildings were adapted by the Russians for defense, even when they were in a ruined condition.

The Germans were virtually forced to give up large-scale tank attacks as being too costly, and the fighting reverted to intense street fighting between relatively small infantry and engineer assault groups, liberally supplied with flame-throwers.

The main difference between the fighting in Stalingrad and that which took place at other inhabited localities along the Eastern Front was that considerable quantities of artillery of every caliber participated on both sides. Many of the Russian batteries were emplaced on the islands and the east bank of the Volga, while others remained among the ruins of the town. The whole site of the city became a complicated tangle of trenches, deep dugouts under blasted buildings, and strongholds in ruins or in the remains of large and strong reinforced concrete buildings, such as abounded in the vast factory area. Here, the theory that the ruins of a city constitute one of the most formidable types of fortification in modern war, was proved to the hilt.

TACTICAL AND TECHNICAL TRENDS

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ARMY GROUND, AIR, AND SERVICE FORCES

by

MILITARY INTELLIGENCE SERVICE,

WAR DEPARTMENT

CONTENTS

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SECTION I

AIR

1. THE PRESENT VERSION OF THE FW-190

Some interesting modifications have been reported from examination of crashed Focke-Wulf 190s, used as fighter-bombers.

The engine is the fully rated BMW 801 D-2, equipped with doping pipes running to each of the 14 cylinders instead of only to 7 as in the previous model. This system is used to increase the power of the engine for a limited time during an emergency. The tank for the doping of gas or fluid is removed from the cockpit to behind the seat, and is of larger capacity, presumably in order to effect the doping of all 14 cylinders. The three fixed louvers at each side of the rear end of the engine cowling on the original design have been replaced by three adjustable gills, which are controlled by a small rotating handle on the upper instrument panel.

Various armament combinations have been found on FW-190s. The original aircraft had as regular equipment two 7.9-mm machine guns mounted above the engine and two MG-151 20-mm guns mounted in the wing roots, all four firing through the propeller arc, and two outboard Oerlikon FF 20-mm cannons. Recent crash reports from England have not included the outboard cannon in the armament. The reason for the omission of the Oerlikons has not been given, but it is possible that the use of these cannon was either experimental or limited to special types of operations. In one crashed plane, only the MG-151 20-mm guns were found, the 7.9-mm machine guns having been removed from the mountings, and the firing channels in the top of the cowling having been blanked off.

A bomb carrier labeled E.T.C. 501 is mounted under the center line of the fuselage. This can carry either a 550- or 1100-pound bomb. There is no fairing around the carrier, but long streamlining is fitted behind, stretching far back along the underside of the fuselage.

The armor, which appears to be unchanged, consists of a 13-mm steel plate behind the head and shoulders of the pilot, 8-mm armor back of the pilot's seat, strips between the seat and the sides of the fuselage, 5 or 6 mm thick, and a bullet-proof windshield 1 3/4 inches thick. The engine is protected by the foremost ring of the engine cowling, which is 5-mm armor, and by a second ring, of 3-mm sheet steel. The bullet-proof glass windshield is fitted with a gasoline spray which can be turned on by a small control on the lower instrument panel. This spray washes away oil that may be deposited on the windshield from the engine.

The normal fuel tanks are now of the fully flexible type, with a capacity of 139 U.S. gallons, and, in addition to these, there are two jettisonable fuel tanks carried under the wing, each holding 80 U.S. gallons. These are jettisoned mechanically by pulling a small T-shaped handle in the cockpit.

Modifications have been made to the airframe, but the main dimensions are unchanged. There is internal stiffening in the wings and in the rear end of the fuselage. The new type of boost gauge, already found in the Do-217, is fitted, and

also a modified fuel-flow indicator for the two main tanks and the outboard jettisonable tanks. A red bulb above the indicator lights when the fuel supply is down to 20 minutes flying. There is a fitting for a small camera in the rear part of the fuselage. The oxygen bottles are of a new spherical type.

Apparently certain faults were found in the design and manufacture of the electrical equipment in the original FW-190s, and these findings resulted in some gradual changes. The plywood top of the fin has now been equipped with an 8-inch aerial mast of the same material, altering the appearance of the top of the fin and shortening the aerial. The radio installation used with the short aerial is a very light type of FuG 16 Z with a remote-control frequency selector.

It is believed probable that an improved version of the FW-190 may shortly appear, re-engined with a BMW 801 E or the 801 J with an exhaust-driven supercharger, which would necessitate considerable modification of the air-frame design. Further development will mainly depend on whether the new engine has 18, 21, or 27, cylinders. Such a redesigned airplane is likely to have a much higher performance. An attempt may be made to improve the speed and climb of the 190, which at present decreases rapidly above 25,000 feet. The MG-151 20-mm guns may be replaced by a larger caliber type, such as the reported 25-mm Rheinmetall. Major improvements of performance and load-carrying capacity are to be expected only with a new type of power plant. The aircraft may be developed chiefly as a fighter-bomber.

2. RUSSIAN ATTACK AVIATION

The following is a condensation of an article by a Russian Colonel, published in the official Soviet newspaper, Pravda, January 5, 1943.

The tactical employment of attack aviation as described in this article appears sound, although overemphasis may have been laid on "dive-bombing." Employment of dive-bombers in the face of heavy ground fire and strong enemy interceptor opposition has proven too costly to maintain in other theaters of operation. The Russian attack plane, the "Stormovik," or "Sturmovik," is, however, believed to be very heavily armored, and consequently may be fully capable of performing the function of attack aviation by purely dive-bombing methods. This plane is equipped with three racks under each wing which carry rocket bombs. These rockets, though not wholly perfected, are reported to have been particularly effective in knocking out German tanks by air action.

The article follows.

* * *

The Red Air Force standard attack plane ("Sturmovik") has proved highly successful and is improving with the development of each new series.

Attack planes operate under all weather conditions except fog. Rain, snow, ceilings under 150 feet, or visibility as low as 1 mile do not deter attack aviation from carrying out its missions. Under such conditions, bombers cannot operate and attack airplanes must be used to wipe out enemy personnel and materiel.

When enemy long-range artillery keeps Red Army units from moving up their reserves, the attack planes search out the enemy positions and silence his guns. When Soviet infantry cannot move through narrow, exposed defiles, the attack planes bomb the enemy mortar positions and machine-gun his personnel. Off the battlefield, the attack plane is employed principally as an assault weapon against enemy infantry and motorized columns. Attack planes usually operate with a fighter escort, but, when the ceiling is low, they operate independently at low altitudes. Close formation flying and good radio communication are important factors in providing mutual protection against enemy fighters.

In the beginning of the Soviet-German war, attack planes operated only at low altitudes. The more conservative senior officers concentrated mostly on the advantage of surprise attack. They thereby automatically excluded one of the most powerful air weapons, bombs of all calibers with instantaneous fuzes, since with this tupe of fuze it was impossible to gain the necessary altitudes before the bombs detonated. On the other hand, experimenting in combat, it was ascertained that bombing from too high an altitude affected accuracy. Dive-bombing by attack planes proved to be the successful solution. In other words, it is necessary to change to air tactics which prove successful, and to leave conservatism behind.

Because of the variety of missions assigned to attack aviation and the fact that the pilot flies alone, he must be versatile. He must be able to fly his plane, navigate to his target, drop his bombs, fire his cannon and machine guns on small targets, and return to his airdrome. He must know the organization and dispositions of his own troops, as well as the terrain over which he operates. In addition he must have perfect knowledge of the plane in order to control it close to the ground against the heaviest antiaircraft fire and against surprise attack by enemy fighters.

The attack pilot must therefore possess the courage of a pursuit pilot, the aim of a bombardier, the experience of a qualified navigator, and the skill of a long-range reconnaissance pilot. No aviation school can train a student to be expert in all these lines; thus, it is necessary for the pilot to augment his flying education in combat. Experience has proven that the axiom "the more difficult the training, the easier the combat" is especially true of attack pilots. It is imperative that experienced officers keep close check on new pilots. If one of the latter demonstrates any particular weakness, he must be given additional training along that line. If he bombs poorly, he must be immediately put on the "polygon" bombing course; if he has trouble orienting himself in a certain region, he must fly in a training or observation plane until he is thoroughly familiar with the terrain, etc. He must be taught to change his tactics quickly when necessary, by drawing on experiences of his own and of others.

ANTIAIRCRAFT

3. GERMAN SEARCHLIGHTS

In World War I, searchlights were occasionally used to locate intruding aircraft, but they were not sufficiently coordinated with air defense to cause enemy pilots much concern.

In the present war, the use of searchlights in belts, clusters, and circular groups is a part of the complex defense system that the Germans have devised to offset the effectiveness of massed assaults by Allied bombers. The organization of German searchlights and guns is on a regional basis. Each region controls the permanent flak defenses, fighter units, reporting system, balloon barrage, and civil defense. The Germans have organized their searchlights well and use them effectively for illuminated target fire with their gun defenses (see Tactical and Technical Trends, No. 6, p. 6).

Searchlight belts were first seen in Germany in March, 1941. The most extensive belt had an enormous number of searchlights, but no flak. It was solid light and extended 10 to 20 miles in depth, its sole purpose appearing to be the direction of GAF night fighters to the enemy bombers. This belt was discontinued in May, 1942, probably because it was not sufficiently effective to justify such a heavy concentration of lights and operating personnel. However, searchlights which were employed in cooperation with flak had obtained some considerable measure of success, as they tended to impede accurate navigation of Allied planes and subjected their crews to considerable strain en route to and from their objectives. Concentrations or groups of 10 to 15 and 20 to 40 lights were found in fighter-protected areas, on the approach lanes to important targets, and in gun-defended terrain. Batteries of two or three lights, set 25 to 75 yards apart, have also been seen.

Last November, searchlights appeared in the form of circular groups of 15 to 30 lights, the majority of which were controlled by master lights. The master light, which has a bluish tint due probably to the small divergence of beam and the very high current used, picks up the aircraft, and then the cone of light produced by the group centers on the master light and moves with it. The accuracy of the master light suggests that it is controlled either by some form of radio detection device or by a particularly efficient system of sound location. However, unless the remainder of the lights in the group promptly expose and illuminate the plane, they can often be avoided by an immediate change of course or speed. Each cone unit is coordinated with a larger number of antiaircraft guns. Spaced between the various cone groups, there are individual lights searching for the planes. When a plane is in focus, other beams join the first and hold the aircraft until the cone can pick it up. At heights up to 18,000 feet, 15 to 30 cones give very good illumination, and they are particularly effective in directing flak between 5,000 and 14,000 feet.

Until the aircraft is firmly held, searchlights are either radio-detector-controlled or controlled by sound. If the searchlight follows a rapid change in course, it is usually radio-detector-controlled. If it gropes for the aircraft and cannot follow rapid changes, it is probably sound controlled. Many of the lights

now search independently. When the plane is spotted, searchlights using visual remote control concentrate on it to form a cone.

Searchlights used independently of flak have several purposes. They silhouette planes so that night fighters can see them more easily; indicate the track of attacking planes to night fighters, antiaircraft units, and searchlight-cone groups; dazzle bomber crews so they cannot see fighters or targets; hide targets from view by concentrating a cone of light over them; and counteract the effect of parachute flares by placing a cone of light under the descending flare.

A single searchlight may indicate the track of an Allied bomber by pointing at it vertically and then moving horizontally in the direction of its course. It may also focus on a point in advance of the bomber's estimated course, and, perhaps, wave in the direction of flight. Circles are described around the plane to indicate its presence and track, and to invite other individually controlled searchlights to focus on it until it can be transferred to a cone. Successive pairs of lights, directed one on each side of the plane and forming a lane, may indicate the path of the bomber. Sometimes a wall may be formed to silhouette the attacking plane for night flighters flying at the same level. The projection of light patches on a cloud below the aircraft silhouettes them to overhead fighters and a cone may similarly be used as a background.

The dazzle effect of the light is greater in a haze than in clear weather. Lights may sweep horizontally to dazzle crews, making it difficult to see the target. A single beam cannot produce a "dazzle" effect except at short range, but concentration of several beams can cause acute difficulty to the pilot or bombardier. It can occur only when the aircraft is directly illuminated, and, although effective up to 15,000 feet, is most pronounced between 2,000 and 4,000 feet. "Glare" can be very effective on nights where there is considerable ground or industrial haze. The searchlights sometimes project beams at a low angle of elevation onto the haze, producing a pool of light over the target and making identification difficult for bombing crews. Both dazzle and glare interfere with night vision, make the location of targets difficult, lessen bombing accuracy, and help night fighters to approach the enemy bombers unobserved.

A recent analysis of searchlight operations led to the following conclusions: German antiaircraft defenses rely mainly on unseen methods of control but augment their fire by visually controlled guns, using searchlights only when there is little or no cloud. Among aircraft coned by lights for more than 20 seconds (and therefore probably engaged visually), the percentage damaged has been about twice as high as among planes illuminated for a shorter period. There was no evidence that those coned for more than 20 seconds were subjected to more intense antiaircraft fire than others. The risk of being illuminated by searchlights seemed to be about the same at all bombing altitudes (6,000 to 20,000 feet). On one occasion when conditions were favorable for searchlights, there were 70 to 80 bombers over a target at one time and they were effectively coned (i.e., for more than 20 seconds) atthe rate of about one per minute. Heavy antiaircraft fire in coordination with searchlight cones is extremely accurate and destructive. Once a cone centers on a plane, it ignores all other aircraft and proceeds methodically to direct the destruction of the one it has caught.

ANTITANK

4. THE SPOTLIGHT ANTITANK LAYING TEACHER

This particular apparatus can be adapted to any equipment for training in antitank shooting.

The following description, and the accompanying sketches taken from British sources, are based on the adapting of a "mock-up" 2-pounder (40-mm) antitank carriage which had originally been fitted with an aiming rifle and telescope. The apparatus, however, can be modified to fit on the barrel of a 2-pounder gun or any other equipment to suit particular circumstances.

The spotlight device consists of a flat metal bar on which a tube is mounted with a lamp box fitted at the rear end. The box houses a 6-volt bulb, and its inner face is pierced with a pin hole to allow the light to pass through the center of the tube. The tube is adjustable for deflection and elevation.

The opposite end of the tube is provided with an adjustable carrier fitted with a lens; by this means the spotlight is focused. Any suitable lens available, can be used. The length of the tube should be such that the distance from pin hole to lens is approximately equal to the focal length.

Two press switches should be included in the circuit in parallel, one operated by the firing mechanism and one by the instructor. The details of the target and the alignment of the spotlight are described below, with details of construction shown in the accompanying sketches.*

a. Target and Frame

The target frame is rectangular and is approximately 7 ft. long and 5 ft. deep, but any suitable means of carrying the target and of providing a background may be utilized. The corners are cross-battened, and wood supports are fitted to the bottom corners.

A metal rail 1 in. by 1/8 in. and about 9 ft. long is fitted between the uprights of the frame, the flat side of the rail being vertical. The rail is bent horizontally and forms a track for the target. If desirable, one end of the rail may be slightly higher than the other (say 6 inches).

Wire hooks are soldered at varying intervals along the rail to act as guides for the endless towing cord. The towing cord runs over pulleys fitted to the uprights of the frame, a winding handle being fitted at one end.

The target carrier is made from a piece of light sheet metal 5 1/2 in. by 4 1/2 in., on one side of which is mounted a model tank also cut out from light sheet metal, and about 2 in. by 1 in. by 1/2 in. when made. On the other side of the carrier a balancing weight is fitted.

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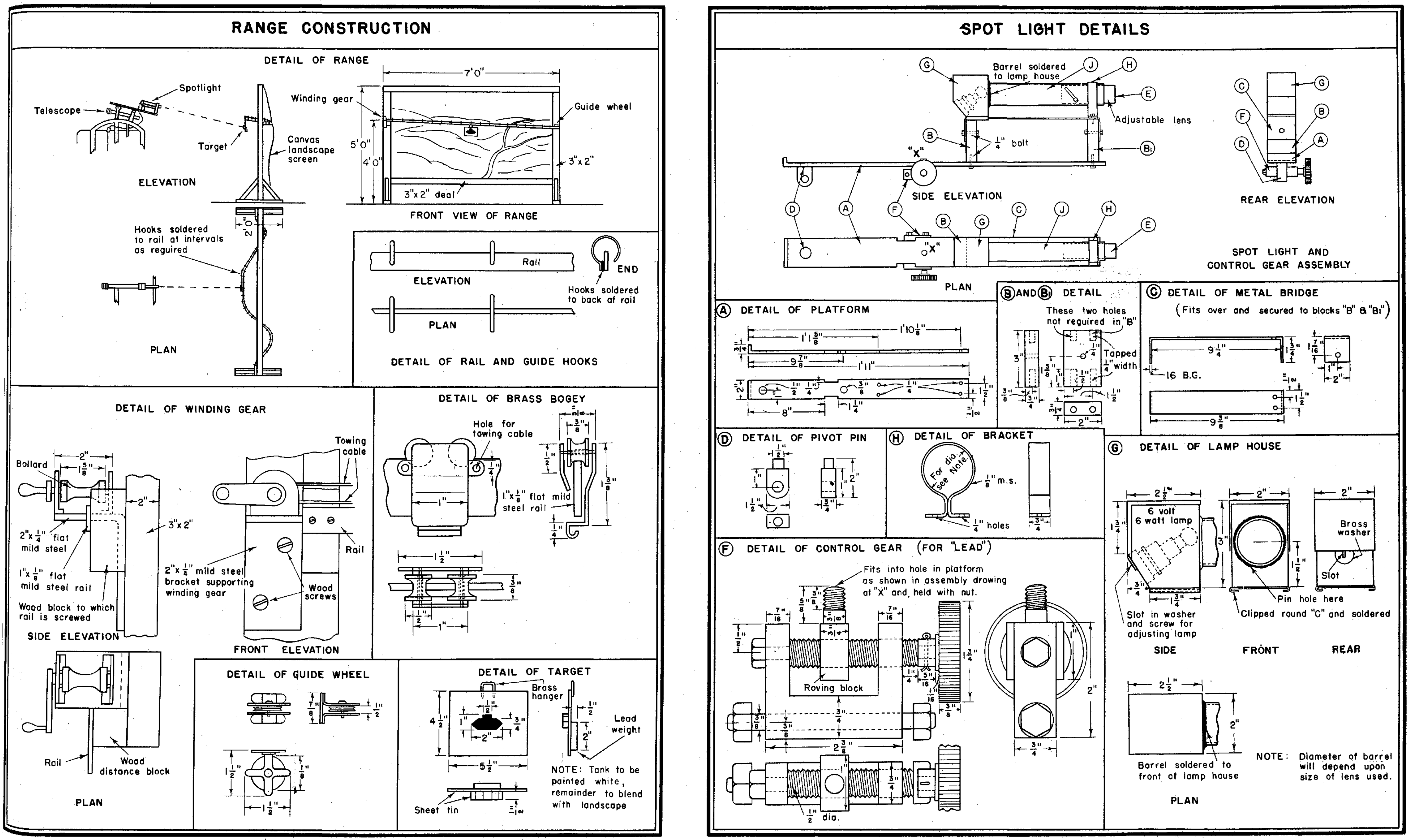
*The specific materials referred to in the sketches and text, such as brass and mild steel, are not necessarily the only suitable kinds.

SPOT LIGHT ANTITANK LAYING TEACHER



The target carrier is suspended from a bogey which is pulled along the rail. The two ends of the towing cord are attached to the bogey and pass around a small winch gear by means of which the movement of the carrier is controlled.

The target carrier should be finished with light-colored paint, while the tank itself is painted white, which is the most suitable color for showing up the spot of light.

A back cloth of burlap, with a landscape painted on it, may be fitted to the rear of the target.

b. Setting Up

The spot-light apparatus is fitted on the mock-up or gun, and the circuit wired up to a battery or small transformer.

The target frame is placed about 10 feet in front of the telescope.

c. Alignment and Focusing of Spotlight

The target is moved along the rail to the point which is nearest the telescope. It should be so arranged that the tank is now at right angles to the line of sight through the telescope.

The "lead" screw should be placed in the center of its run.

The telescope is set to the chosen minimum "range," say 300 yards, and aligned on the center of the tank, by using the elevating and traversing handwheels.

The spotlight is switched on and adjusted so that the spot appears on the center of the tank and sharply in focus. This is done by moving the adjusting screw on the mounting, at the same time moving the lens carrier backwards or forwards until the spot is seen to be clearly defined and as small as possible. To obtain the best results the filament of the bulb, the pin hole in the lamp box, and the center of the lens should be correctly aligned. As the lens and pin hole are in fixed alignment, the lamp socket should be fitted in such a way as to permit of a small adjustment of the bulb to enable the filament to be correctly positioned.

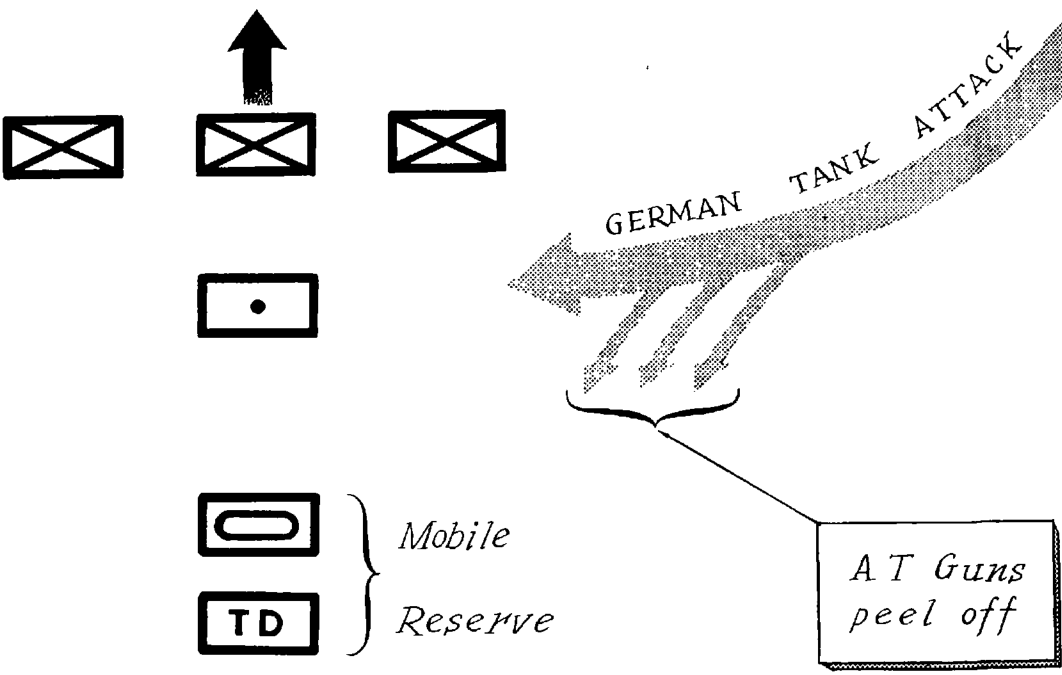
When the spotlight is focused on the tank at the nearest point, the tank is run to that part of the rail farthest from the telescope. The "range" to this point is obtained by bringing the spotlight on to the tank, using the elevating gear. The line of sight through the telescope is then brought on to the center of the tank. This will now show the "range" to the tank, which should be about 900 yards.

d. Control Gear for Lead

In use, the instructor offsets the spotlight for deflection by means of the "control gear for lead" to render necessary the application of lead when laying through the telescope.

5. GERMAN USE OF AT GUNS WITH TANKS

An American army observer in Tunisia reports that German tanks habitually operate in conjunction with AT guns, as has long been their practice. The employment of these weapons is not always the same, but when units encounter enemy tanks they should expect AT guns. One German maneuver wherein the enemy launched a flank attack with tanks against our forces is described as follows (see sketch):



As the enemy armor drove into the flank, its objective our supporting artillery and then our infantry, AT guns, including 88-mm, were "peeled off" and went into position to protect the German tanks from the counterattack of our tanks and/or tank destroyers.

On other occasions the Germans used their often-tried stratagem of sending forward a number of tanks which would then withdraw in an attempt to lure our armor into range of their AT weapons. This is the same stratagem which the Germans used with such success against the British tanks during the heavy fighting prior to the British withdrawal to the El Alamein line in June 1942.

6. DESTRUCTION OF DISABLED TANKS

All U.S. officers interviewed by an American military observer in Tunisia have emphasized the absolute necessity for finishing off a German tank that has

been disabled. One half-track of a U.S. tank-destroyer battalion, after stopping two German tanks, moved forward; as it passed one of the two disabled tanks, a German soldier turned the tank machine gun on the half-track and killed or wounded the entire crew.

Comment: In connection with the above, it should also be noted that under favorable circumstances the Germans have been quick to recover disabled tanks during the night.

ARMORED FORCE

7. NOTES ON THE PZKW 4

The PzKw 4 is the German standard medium tank. It weighs about 22 tons. With the exception of the principal armament, the more recent models of this tank embody essentially the same features. The change in armament consists of a long-barreled 75-mm gun, the 7.5-cm Kw K. 40,being fitted in place of the short-barreled 75-mm gun (see Tactical and Technical Trends, No. 20, p. 10).

The following information on the new PzKw 4 is based on a tank captured in North Africa.

a. Suspension and Armor

The tank has eight small bogie wheels, mounted and sprung in pairs by quarter-elliptic springs, a front sprocket, a rear idler, and four return rollers on each side. The track is of steel, as is usual in German tanks.

The armor probably is as follows: front, back, and turret 1.95 in.; sides 1.18 in.; back and top .39 to .79 in.* Sand bags were carried on top of the turret for additional protection from air attack. (German tanks often carry sand bags and additional lengths of track as added protection.)

b. Dimensions and Performance

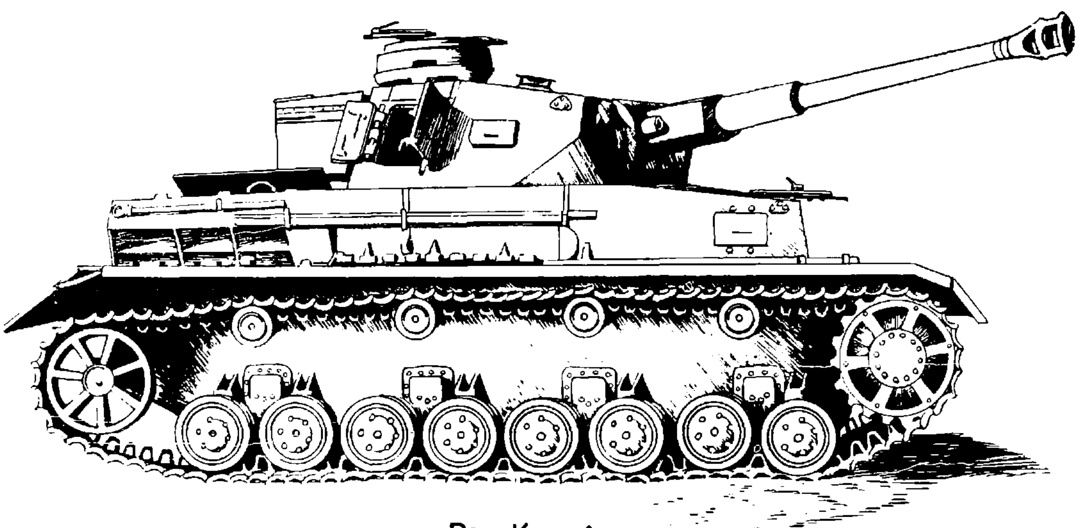
The tank is 19 ft. 6 in. long, 9 ft. 4 in. wide, and 8 ft. 9 in. high, with a ground clearance of 16 inches. It can cross a 9-foot trench, negotiate a 2-foot step, climb a 27-degree gradient, and ford to a depth of 2 ft. 7 in. The theoretical radius of action is 130 miles on roads and 80 miles cross-country.

c. Engine

The tank is powered with a Nordbau Model V-12, four-stroke, gasoline engine, developing 320 hp. It has overhead cams, one for each bank of engines,

*Later details indicate that the armor arrangement on current models of PzKw 4 is the same.

and magneto ignition. There are two Solex down-draught carburetors, and twin radiators, with a fan for each, mounted on the right-hand side of the engine. An inertia starter* is fitted. The fuel capacity is 94 gallons for the engine and 20 gallons for the 2-cylinder turret-drive auxiliary engine.



Pz. Kw. 4

d. Clutch, Brake, and Drive

The clutch is incorporated in a gear-box which is of the ordinary type with 6 forward speeds and reverse. The brakes, operating on epicyclic gears, are air-cooled and hydraulically operated. The drive is through the engine, drive shaft, clutch, gear box, bevel drive, steering system, final reduction drive, and sprockets.

e. Instruments

Instruments include a revolution counter (tachometer) to 3,200 rpm with 2,600 to 3,200 in red, speedometer to 50 kph (31 mph), odometer (mileage indicator), a water temperature gauge, and two oil pressure gauges reading to 85 lbs. per sq. in. The tank is fitted to take an electric gyrocompass on the left side of the driver.

f. Armament

The tank mounts the long-barreled 75-mm gun and two model 34 machine guns, one fixed coaxially on the right side of the gun, and the other one set in the

*An inertia starter is a starter equipped with its own independent fly-wheel to build up starting inertia.

hull firing forward. While reports vary, it is thought that the gun will penetrate 2 inches of homogeneous armor at about 2,500 yards at 30 degrees. The breech is of the vertical sliding type. Firing is electric, with a safety device which prevents firing if the breech is not closed, the gun not fully run out, or the buffer not full. The traverse is by hand, or by power from a 2-cylinder, 9-hp auxiliary gasoline engine directly coupled to a generator, which supplies current to the turret traversing motor. The turret floor rotates. Eighty-three rounds of 75-mm AP or HE and smoke are carried. Five smoke candles may be carried on a rack at the rear of the tank. These candles are released from inside by a wire cable. Twenty-seven belts of 75 rounds each are carried for the machine guns.

g. Radio Equipment

Intercommunication is by radio-telephone. The aerial may be raised or lowered from inside the tank. The set is situated over the gear box on the left side of the hull gunner. Below the 75-mm gun is situated an insulated aerial guard which deflects the aerial when the turret is traversed.

h. Crew

The crew numbers five: driver, hull-gunner and radio operator, commander, gunner, and loader.

8. GERMAN DESTRUCTION OF OWN TANKS

Toward the end of last year, one German tank regiment commander in the Middle East found that he was losing far too many tanks--and these not all through British action. Some were being prematurely or unnecessarily destroyed by their crews. In an effort to stop this he issued the following order:

"Tanks may be blown up only in the following circumstances: (a) the tank cannot be moved, and (b) the enemy is attacking, and (c) the tank has defended itself to the last round.

"The person responsible for giving the order to blow up the tank must send in a report to regimental headquarters, giving the circumstances."

9. FIRE FROM GERMAN TANKS IN A NIGHT ATTACK

A U.S. Army observer in Tunisia reports that in a German night tank attack against one of our tank destroyer units, the German tanks would fire their coaxially mounted machine guns at every object that had the slightest resemblance to a tank or armored vehicle. If the tracer ricocheted (indicating that it had struck a hard surface), it would be followed immediately by a round from the tank gun. Apparently the Germans did not mind wasting ammunition on rock piles, bushes,

haystacks, etc., on the chance of perhaps getting a destroyer.

Comment: German tanks often fire on suspected antitank gun positions. In Tunisia the "rock piles, bushes, haystacks, etc." were, of course, often used for camouflage.

CHEMICAL WARFARE

10. JAPANESE SMOKE WARFARE*

a. Organization of Smoke Troops

For some years past the Japanese have been engaged in developing the means of employing chemical warfare in their Army and Air Force. They are known to have organized a Chemical Warfare Department with a technical research branch and to have established units of Chemical Warfare troops. However, Chemical Warfare activities in the Japanese Army have been more or less decentralized. It is not known definitely whether there is a separate Chemical Warfare branch of the service similar to that in our Army. A recent report states that there has been created in the Japanese Army a new Chemical Warfare Inspectorate headed by Lt. General Kazumoto Machijiri. A Chemical Warfare school is located at Narashino.

A foreign report, admittedly not verified, states that the Japanese have chemical troops organized into sections, platoons, companies, battalions, and regiments - the latter units consisting of approximately 1,500 men each. This report (January 1941) refers to the 5th and 6th Chemical Warfare Regiments as being the only Chemical Warfare units in China. It is pointed out that from this information one might presume the existence of the 1st to 4th Chemical Warfare Regiments. According to this same report, one of the two chemical regiments in China was at that time reported to be preparing to leave for French Indo-China.

According to a document which appears to be an annex to an operations order, and which the Chinese claim to have captured from the Japanese during combat operations in the vicinity of Anking in June 1938, the Japanese employed chemical units on each flank of their forces. These units were provided with chemical projectors and comprised one company on one flank and one squad on the other flank.

According to a recent report from Chungking, China, the Japanese Army has a Chief of Chemical Warfare and a Chemical Warfare Branch. The tactical unit of the Chemical Warfare Branch is the battalion. To allay suspicion, all chemical units are referred to as "smoke" units. The smoke battalion is a flexible organization with any number of smoke companies above two. Each combat regiment gives special training in gas warfare to selected men. Each regiment is able to form one smoke company of such men. However, the smoke company is not listed as a tactical organization of the regiment. Each regiment has a gas officer.

*Reprinted from a recent Chemical Warfare Bulletin.

b. Japanese Smoke Tactics

A translation of a Japanese military training pamphlet on the "Use of Special Smoke" indicates that the Japanese are familiar with the tactical employment of smoke. The translation of this Japanese document states that "It is a short cut to victory to launch vigorous and dashing assaults under the barrage of special smoke, taking good advantage of its effects," and further states that "ordinary smoke may be used to enhance the screening effect of the special smoke." It is pointed out that gas masks should be worn in such cases, and not removed until ordered. The obvious conclusion is that the "special smoke" is toxic.

The principal Japanese weapon for the employment of chemical munitions, according to a reliable foreign report, is the 90-mm mortar type "94" for which a maximum range of 4,155 yards is claimed. It fires a projectile weighing from 11 to 57 pounds. The total weight of this trench mortar is approximately 350 pounds.

Both non-toxic and toxic candles have been used by the Japanese. Non-toxic types include smoke candles and lacrimatory gas candles. (See Tactical and Technical Trends Nos. 7, p. 10 and 21, p. 11.) The former is reported to be filled with a Berger-type mixture of zinc, zinc oxide, and clay-like material, the latter filled with tear gas.

A Japanese handbook on the use of toxic smoke generators enumerates the following points:

(1) Various alternatives are given as to density, and it is stated that generators put down 1 meter apart may affect an area 1,500 meters (1,640 yards) deep. The normal density, however, is given as 2 or 3 rows of generators not less than 20 cm (7 to 8 inches) apart.

(2) The ideal distance of the release line from the enemy is given as 300 meters (328 yards) and the maximum as 500 meters (547 yards).

(3) Generators are not to be employed in daytime unless the weather is dull and the speed of the wind does not exceed 6 to 10 mph. Under such daytime conditions, they may be employed "at short distances."

(4) The value of combining ordinary smoke with toxic smoke is stressed. The advantages claimed are that ordinary smoke will show the direction of the wind before the toxic generators are ignited. This will give the infantry additional cover during their advance.

The same handbook states that the commander of the smoke unit must cooperate with the commander of the unit with whom generators are to be used, and he must reconnoiter. Planning his smoke screen according to the general plan of attack, he must issue orders covering the following points:

(a) Information regarding enemy and friendly troops
(b) Location of objective and results desired
(c) Position of smoke line
(d) Orders covering meteorological information
(e) Probable zero hour for ignition
(f) Disposition to be taken up after ignition
(g) Pursuit and attack plans
(h) Transportation orders
(i) Signal plans for the ignition order.

c. Actual Use of Smoke by the Japanese

In the first battle of Changsha, China, during October and November 1939, the Japanese made very extensive use of smoke screens. They are also reported to have used smoke extensively in operations of all kinds in the attacks in Malaya, but only to a limited extent in the Burma campaign.

Some 200 smoke floats, weighing 22 pounds each and with an emission time of 8 minutes, were reported used in the Japanese landing operations at Anking, in June 1938.

Japanese orders, captured by the Chinese, indicate that 1,300 small generators were to have been used by the infantry together with toxic generators in different sectors, in the ratio of between 1 : 10 and 4 : 10, respectively.

The Japanese used steel, floating smoke pots, with a chlorsulfonic acid filling, during the landing operations at Milne Bay in New Guinea.

In August 1936, a Japanese newspaper referred to the development of smoke-forming mixtures capable of functioning in extreme cold (-60 degrees F). The mixture was composed of stannic chloride or antimony pentachloride and titanium tetrachloride.

Japanese plans for the use of smoke to screen the unloading of troops and supplies at and near Lae, New Guinea, are revealed in an enemy document, which is paraphrased below:

Three hans (at normal strength they are roughly equivalent to our squads) were selected for the operations, under the direction of a first lieutenant. Each han was given the responsibility for screening a separate area.

No. 1 han was composed of a sergeant major, another non-commissioned officer, and 20 privates. It was allotted 6 collapsible boats, and if needed, an armored high-speed boat. This han was to use 200 smoke candles of the floating type, 10 of the large "94" type, and 160 of the small "94" type.

Nos. 2 and 3 hans were allotted a non-commissioned officer as leader and 15 privates. They were each equipped with 100 floating candles, 7 of the large "94"-type generators, 120 of the small "94"-type generators, and 3 collapsible

boats. In addition to the above equipment allotted to the three hans, 400 floating-type candles were to be kept in readiness.

Regulations for the formation of smoke screens are to be based on orders from Debarkation Unit Headquarters.

When operations begin, all smoke candles are to be lighted at the same time, when the signal shots (red dragon) are fired. The main smoke operations are to be carried out by boats over the designated water area. Smoke operations will also be conducted over land, according to circumstances.

A study of the Japanese diagram shows that in this operation, the enemy planned to lay smoke screens by placing candles on the rear part of boats, and also by placing the floating-type candles at certain designated intervals in the water.

Smoke signaling may be done with the 50-mm mortar, with a vertical range of 100 yards. The following flares have been noted, but their meaning has not been made clear:

Green hanging star	(with parachute)
Yellow dragon	(with parachute)
Two red stars	

ENGINEERS

11. LAYING OF ENEMY LARGE PROTECTIVE MINEFIELDS

A study of the enemy employment of minefields in North Africa has shown their various tactical uses. One of the principal of these uses is the protection of the entire front of a major defensive position. This type of minefield can be designated the "Large Protective Minefield," and its construction follows a more or less fixed procedure. This procedure results in protection being built up gradually but concurrently along the entire front. The first steps are such that they give the maximum initial protection and at the same time serve as an important part of the final installation. The actual construction can be conveniently divided into three phases, which are described in the following paragraphs.

a. Phase One

A single continuous belt of mines is laid along the entire front. This belt is generally marked and protected on both sides by concertina or barbed wire; the spacing between the rows of wire is usually about 200 yards, but may be as much as 800. While this initial belt is being laid, the incomplete points in the line are held or supported by armor.

As soon as the initial belt and marking wire have been laid, thickening of the field is begun by placing an additional belt of mines in front of the forward wire marking the initial belt. The front edge of this second belt is generally not marked during this phase of preparation. From the start, the area mined during this phase is covered by short range, small-arms and antitank fire, while listening and machine-gun posts are interspersed throughout the field.

While this initial phase of mine-laying is under way, the construction of the battalion defense areas is in progress behind this belt of mines. These defense areas are being spaced from 1 to 2 miles from center to center in mutual support as shown on the accompanying sketch. As these defense areas and the mine belts near completion, the armor is moved to the rear for a counterattack role.

b. Phase Two

One step in this phase is the marking and protecting by concertina or barbed wire of the second belt of mines laid in the first phase, and the thickening of the field by placing an irregular belt of mines in front of the new forward wire. This forward belt is complicated by numerous unmarked tactical spurs and small scattered minefields farther out, together with scattered wire obstacles and false gaps. This forward zone is likely to be sown with all forms of antipersonnel devices and automatic trip wires. It may extend as much as 800 yards in front of the original front wire.

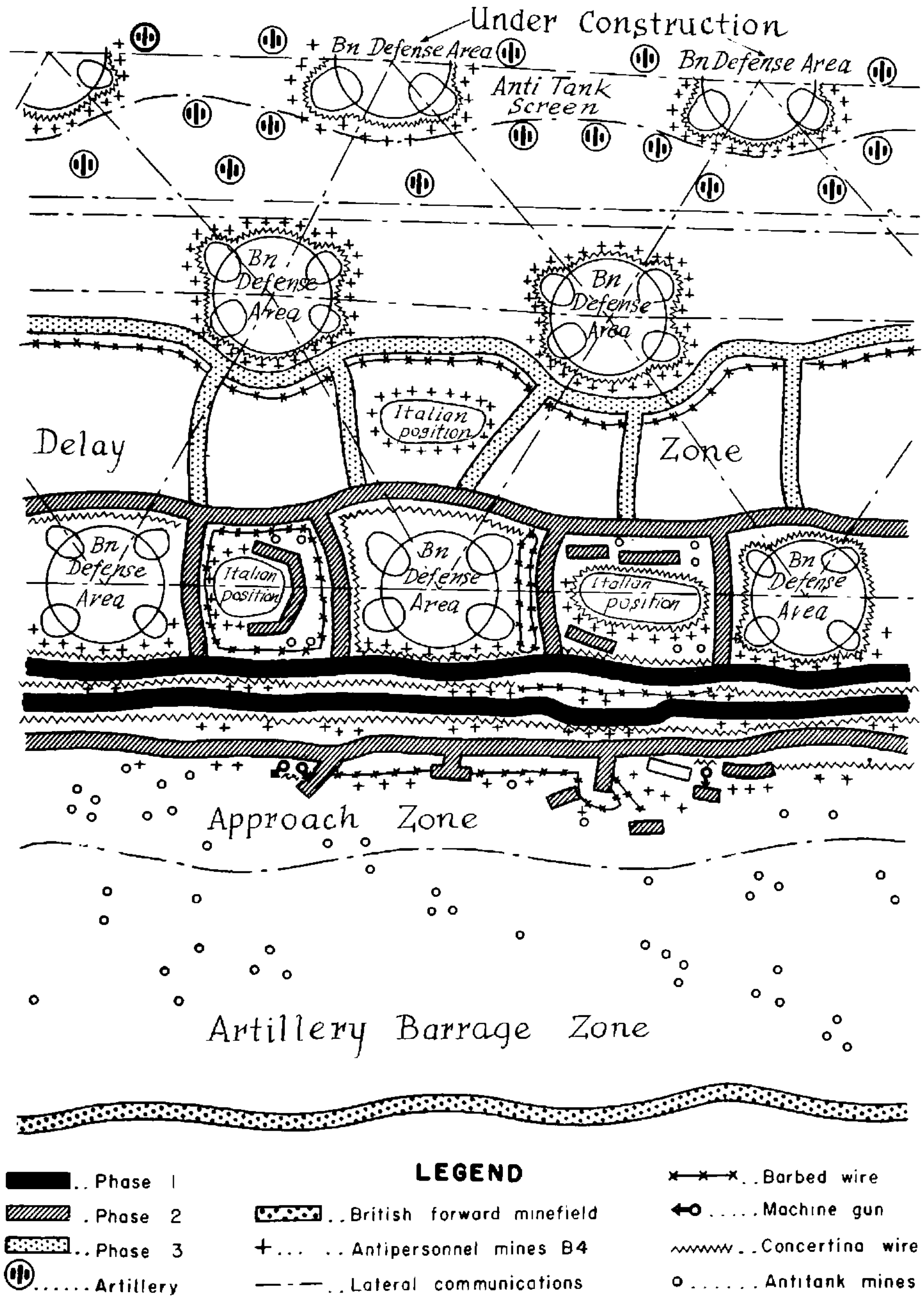
A second step is to lay a belt of mines to afford protection to the second line of defense areas, which is being constructed during this phase. The minefields are from 100 to 200 yards deep and are sometimes not as clearly marked as the front fields. The defense areas are echeloned back from the original defensive line, and tactically sited to support it. The second line of defense areas form triangles, on 1 to 2 mile centers, with the forward defense areas.

Another step in this phase is to interconnect the original mine belt and the rear belt described in the proceeding paragraph; these interconnections serve, by hindering lateral movement, to canalize and disorganize any enemy penetration through the front,line belt. This, in effect, serves to compartment every local success of the enemy. In this connection it has been noted that although the layout and marking of the minefields may appear ill-defined or haphazard to the ground observer, they are generally very distinct on air photographs.

c. Phase Three

A third line of minefields, generally well marked, is then laid to give additional protection to the front and flanks of the second line of defense areas. This new line of minefields may at this time be connected with the second belt of mines discussed in phase two; it serves to further compartment the field and to disrupt lateral movement by the enemy in event of local enemy successes. The third line of minefields is usually about 200 yards deep.

LARGE PROTECTIVE MINEFIELD



During this phase, further thickening of the previously laid belts may take place by the addition of booby traps, antipersonnel mines, and small minefields and scattered mines, usually unmarked. In rear areas, tactical and protective fields may also be laid at this stage; these are usually visible on aérial photographs

Troops holding front main defense areas are likely to be thinned out gradually at this stage, and a third line of defense areas put under construction in the rear area.

12. GERMAN BLAST DRIVE ROD, D.K.

A German blast drive rod has been designed for the rapid production of small-diameter, vertical holes in the ground. The letters D.K. are an abbreviation for Donnerkeil or "thunder wedge." The equipment consists of a drive rod, two tubular hand levers, a long thin steel rod, a propellant charge with safety fuze and igniter, and a detonating fuze with prepared igniter. It is used for the erection of telegraph poles and similar supports.

a. Description

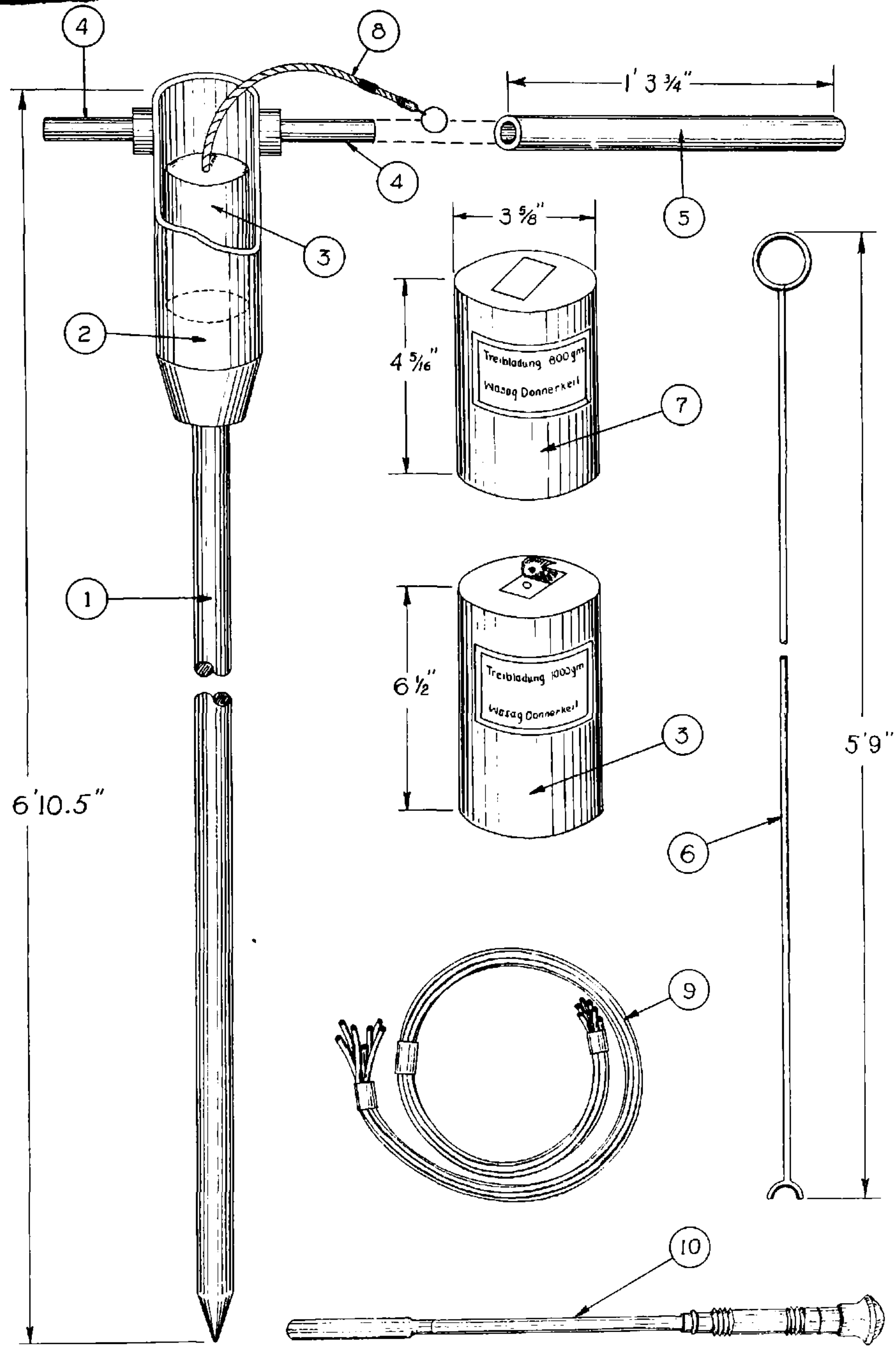
The drive rod (1-see sketch) is of steel, 5 ft. 9 in. long and with a diameter of 1.5 in. At its upper end is attached the pot or firing chamber (2), which is cylindrical in shape, 1 ft. long and with an external diameter of 4 3/4 in. The over-all length of drive rod and pot is 6 ft. 10 1/2 in., and the weight 70 lbs. The pot houses the propellant charge (3). Two projections (4) near the top of the pot receive the two hand levers (5), which are of tubular steel, 1 ft. 3 3/4 in. long and a diameter of 1 3/8 in., each lever weighing approximately 2.2 lbs. The thin steel rod (6) is 5 ft. 9 in. long and has a diameter of 1/4 in., with one end forked and the other provided with a loop. The propellant charge (3) is cylindrical, 6 1/2 in. long and with a diameter of 3 5/8 in., and contains 2 lbs. 7 oz. of black powder. A small charge (7) is also included; this has the same diameter as the propellant charge (3) but is only 4 3/8 in. long and weighs 1 lb. 7 oz. The propelling charge is initiated by 1 ft. of safety fuze (8) giving a delay of about 30 seconds, and fired by a Zdschn. Anz.* 29 or Zdschn Anz.* 39 friction igniter (see Tactical and Technical Trends No. 26, p. 21.) The explosive charge consists of seven 5-foot lengths of instantaneous fuze (9), with a total weight of 11 ounces, tied together in three places; this charge is fired by a "demolition set" (10) consisting of a detonator, 6 inches of safety fuze, an adaptor, and a Zdschn. Anz. 39 igniter, and giving a delay of 15 seconds.

b. Method of Use

The drive rod (1) is set vertically over the spot where the hole is to be drilled, and is pushed in by hand until securely held. The propellant charge is

*Abbreviation for safety-fuze igniter.

[redacted]



GERMAN BLAST DRIVE ROD, D.K.

then inserted in the pot (2) (the large charge (3) being used for hard and the small (7) for soft ground) and fired, driving the drive rod into the ground. The lever rods (5) are placed over the projections (4) and worked until the drive rod (1) is free and can be withdrawn. The bundle of instantaneous fuze (9) is then placed in the hole by means of the rod (6), sufficient fuze being left above ground for attachment of the demolition set. Firing of the instantaneous fuze enlarges the hole to a diameter sufficient to take a telegraph pole.

INFANTRY

13. GERMAN HABITS IN DEFENSE AND ATTACK

General

Obviously drawn from battle experience, a set of rough lecture notes entitled "The German Army and You," received from the British School of Infantry, has provided the source material for this article. It is stated in the introduction that enemy methods lack originality and, because of the tendency to repeat the same methods, repay study.

Part I - German Habits in Defense

a. Location of Positions

(1) Advanced positions

Advanced positions (Vorgeschobene Stellungen) are apt to be from 6,000 to 8,000 yards ahead of the main line of resistance. Always covered by German artillery fire, they are usually held by reconnaissance units, frequently motorized, including motorized machine-gun battalions, vehicles of which it is important to recognize. With antitank guns and fire power, units occupying these positions hold key points (railways, crossroads, and river crossings) and engage in demolition and patrolling operations. Their mission is to get early information as to the point to be attacked, and promptly pass it back. When attacked, they withdraw under the protection of their own artillery.

(2) Outposts

The outposts (Vorposten), in strength at least platoon groups, and perhaps companies, are pushed 3,000 to 4,000 yards in front of the main line of resistance. Outposts are well covered by artillery and are supplied with antitank guns. Liberal use is made of dummies. The outpost mission is to defend the forward observation posts and to deceive the enemy into making a large-scale attack. Such value is placed on forward observation posts that outposts, although they may withdraw under cover of artillery, put up a stubborn resistance.

(3) Main Battle Positions

Main battle positions (Hauptkampffeld Stutzpunkt) tend to be a line of hedgehogs (Igeln), which provide all-around resistance or support points composed of all arms. Sited on high ground for observation, they are likely to be found in triangular groups, two astride and one behind a vital point. Single companies usually occupy an area about 400 yards square. With highly developed arrangements for supply by air, such support points are often isolated, particularly in the case of defended villages. The nature of the ground and the width of the front held, naturally, are the determining factors.

(4) Doctrine of "Schwerpunkt" (Center of Gravity) in Defense

As in offense, where the utmost concentration of effort is applied to a narrow front to crash through all opposition, so in defense, the heaviest concentration of fire and other defensive measures is prepared in order to hold vital points at any cost--at the sacrifice, if necessary, of secondary positions. In country unsuited to tanks, the guiding principle of defense is the maximum use of terrain and mines, with a minimum use of antitank guns. Of course, the main antitank-gun defense is concentrated on terrain suitable to tank attack.

(5) The Doctrine of Mobility in Defense

The Germans base their defensive tactics on the accepted principle that provision should be made for a heavy mobile reserve which will counterattack with the utmost available power as soon as the attack is seen to be thoroughly committed to its plan of operation. This is the Schwerpunkt principle in reverse.

(6) Details of Defense

(a) General

Three antitank guns will probably be assigned to each company position, with three kept in mobile reserve with the battalion mobile guns. Particularly during the construction phase of the defense, camouflage is very thorough. Slit trenches are preferred to the more elaborate types. To dissipate the enemy's fire, considerable use is made of dummy and alternate positions. There are seldom many bursts of fire from the same position. Rather, the defenders move out of the alternate or dummy positions into the real positions.

(b) Heavy Machine Guns and Mortars

The locations of heavy machine guns and 3-inch mortars are not determined solely by range but rather by such considerations as:

i. Site of the observation point.

ii. Method of control. (There is little signal equipment in use; communication by wire is very limited, and there is no radio. Only 8 miles of cable are

provided for both the battalion heavy weapons company and the infantry howitzer company.)

iii. Mortars are usually sited in pairs, from 30 to 50 yards apart.

(c) Siting of Heavy Infantry Howitzers

In the use of heavy infantry howitzers, it must always be borne in mind that the ammunition available to them is apt to be more limited than is the supply for field artillery batteries. Its expenditure must be economical, and the Germans place these weapons where the maximum use can be made of the available ammunition.

(d) Principles of Antitank Defense

i. Even at the risk of firing into supporting troops, the primary duty of all weapons is antitank fire.

ii Extensive use of minefields--as many as 11,000 mines to a division front--is common German practice. Weight for weight, mines are preferred to artillery. Dummy minefields are a favorite device. [Other sources report that there are enough live mines in such fields to make them real obstacles.]

iii. Almost never are antitank guns placed singly, but rather, to prevent flanking, in pairs back to back. In order to impede armored reconnaissance, they may be expected in outpost positions.

iv. Never to fall back before a tank attack is a rule hammered into all German infantrymen. Instead, they are trained to stand fast, and to save their ammunition for use against the foot troops following in rear of the tanks.

(7) Features of Rommel's Retreat Orders

One of General Rommel's directives, which fell into British hands, featured the following principles:

i. Schwerpunkt (center of gravity doctrine, previously explained, which applies to all units regardless of size).

ii. A "main effort" was to be executed by not less than a complete company, heavily reinforced by supporting arms and directed at a point along the main axis of the German withdrawal. [The Schwerpunkt principle emphasizes concentration of force and discourages dispersion.]

iii. Careful flank protection; platoons designated for such missions were reinforced with supporting arms.

iv. Use of tanks, engineers, and scattered minefields.

Part II German Habits in Attack

a. General

The German attack is likely to be stereotyped and fashioned after their instruction training combat exercises. This generalization applies from the highest to the lowest units. One document that came to British hands featured a "Battle Drill," and there are "drills" for assault troops. They emphasize organization and detailed execution. Surprise is sometimes achieved as a result of thoroughness in reconnaissance and the weight of the stunning blow. [Note: Frequent variations in methods are to be expected. The Germans simply emphasize teamwork - not individual grandstand plays. This, the author has apparently mistaken for lack of brilliance in plan and originality.]

b. Thorough Reconnaissance

Special reconnaissance units cover relatively wide areas: in desert warfare and open terrain 12 x 12 miles for infantry, 60 x 60 for armored. Determined to get information at all costs, the German does not hesitate to employ on these missions tanks and antitank guns. German reconnaissance officers accept great personal risk, and the units themselves purposely offer tempting targets in order to uncover enemy gun positions. Patrols are equipped with special night-glasses and wire cutters. Except perhaps in pursuit, the attack is not launched until reconnaissance is complete, with both enemy flanks plotted and, if possible, the enemy rear as well.

c. Outflank, Encircle, Destroy

Capture of ground is not the object of German attack, but rather the total destruction of the enemy. Following upon a search for a point of penetration, the ultimate assault, even if by a company only, must be "frontal," but flanking operations, kept out of the line of the fire support, ensure the enemy's destruction.

d. The Application of "Schwerpunkt" Doctrine

First, a thorough reconnaissance is made of the selected point of attack. This point must be on a good route for the projected advance. A frontage of 400 to 600 yards is sufficient. At the expense of other sectors, an overwhelming force of all arms is assembled before such a thrust-point.

e. The Attack

As soon as sufficient information is at hand, and while reconnaissance is being continuously pushed, deployment and preparation for the attack are made.

(1) The "Break-In" (Einbruch)

(a) Methods

Five different methods of attack are prepared for by drill and exercises, depending on the nature and strength of the opposition as it is discovered. These

are:

Opposition--strongly fortified. In the lead are special assault-troops (Stosstruppen) consisting of combat teams of infantry and engineers. They are followed by tanks and infantry on a very narrow front.

Opposition--well-prepared but not strongly fortified. Normal armored divisions attack with tanks massed in depth, followed by motorized infantry on a very narrow front.

Opposition--strongly-held river line (such as the Meuse, Marne, Rhine, Albert Canal). The infantry divisions, with engineer reinforcements, attack at different points to establish bridgeheads. Then follow the armored units and motorized infantry.

Opposition--lightly held river line. The mechanized reconnaissance units carrying bridging equipment boldly cross and establish bridgeheads. Armored divisions follow.

Opposition--enemy defenses incomplete. Armored divisions attack followed by motorized infantry.

(b) The Fire Fight

Against the selected thrust-point a violent fire is opened. On a battalion front of 600 yards, during a field exercise, were concentrated (as called for by smoke signal)--

6 heavy mortars from the battalion heavy weapons company;
12 machine guns, from the same;
4 light infantry howitzers (75-mm) of the regimental infantry gun company;
2 heavy infantry howitzers (150-mm).

All this, called the "concert," was exclusive of the light machine guns, submachine guns and the allotment of divisional artillery. A similar procedure was followed by the artillery. The slogan is: "Niederkampfen, niederhalten, und blinden"--beat down, hold down, and blind. Great stress is laid on sudden, intense concentrations of fire--not formal barrages--to stupefy the defense, and on the use of smoke. The use of smoke is highly developed.

Hard study has been devoted to the last hundred yards of the assault--books have been written about it-- and the understanding of its significance was thoroughly indoctrinated into the German army by 1938. At very short range, close support is given by 50-mm mortars and smoke grenades, as well as by light machine guns firing long bursts. Factors of noise, shock, fear, and ferocity are all exploited; dive-bombers and screaming bombs (what the Russians call "circus tactics") are piled on, if for no other purpose than to make the enemy fire inaccurate.

(2) The Breakthrough (Durchbruch)

Once the "break-in" has been accomplished, the time-table program of the assault is over. Now the initiative is handed over to the subordinate commanders. Their duty is to "tear the guts" out of the defense. For this purpose, close-support weapons are allotted to the subordinate commanders and their combat teams. As flanks of the attackers become exposed, the attack is not diverted, but the exposed flanks are covered with antitank guns and, if necessary, artillery. Tough localities, such as defended villages, are bypassed, and taken care of by the reserve. Where possible, the gap is smashed open to a width of about 6 miles to permit the passage of pursuit troops without loss from rifle and machine-gun fire.

(3) The Pursuit (Aufrollen)

The object of the breakthrough is deep and rapid penetration. Combat teams relentlessly pursue and never lose contact. As a rule, the smallest pursuing unit is a company with supporting weapons. As in the breakthrough, centers of resistance are bypassed to carry on the pursuit, and flanks are protected by "fanning out" and by the use of defensive positions organized for both all-around and antitank defense.

Part III - Points to be Remembered When Germans Attack

a. Reconnaissance Practice

Signs of "a Schwerpunkt coming here" are: a thorough local air reconnaissance; deep patrolling or raids; and deployment of close-support weapons. Watch closely for--

(1) Mounted or horse-drawn troops: they are almost certain evidence of an infantry division.

(2) A mounted party of more than 32 indicates infantry regimental reconnaissance unit.

(3) Bicycle troops in large numbers indicate an infantry division reconnaissance unit. Motorcyclists alone, not accompanied by side-cars, are probably only dispatch riders, but side-cars suggest armored divisions or motorized infantry.

(4) Armored cars, of the lighter type, may be from an infantry division, which has three in the divisional reconnaissance unit, or they may equally well be from armored or motorized divisions. These latter divisions have mixed reconnaissance units of five light and some heavy cars, and a group of nine light armored cars.

(5) Horse-drawn artillery indicates an infantry division.

(6) Tanks. Armored divisions usually operate reconnaissance platoons of five tanks, moving fast and giving mutual support.

(7) Mine-lifting activity is apt to precede the approach of a Schwerpunkt attack, as are engineers in tanks, the operations of night patrols, and the presence of dive-bombers.

b. German Methods of Attack

(1) Opening Assault

Expect a combination of mass, speed, and momentum, concentrated on a narrow front. If held up, dive-bombers, machine guns, and other close-support weapons will be massed to form a "fire front." The Germans will then try to turn your flanks. NOW IS THE TIME TO LOOK OUT!

(2) Counterattack

Go for the light machine guns and light mortars. Three men lying close together means a light machine gun or mortar, and the mortar gives off a puff of pinkish smoke. To attack them successfully calls for two men working together, one covering the advance of the other until one is in position to use rifle or grenade. Go for the infantry guns, which can be identified by a loud report and a big flash. They are often pushed well forward.

(a) Watch for smoke signals. White smoke means probably "We are here"; colored lights or smoke call for fire support. Turn the information to your own advantage.

(b) Mortars usually fire three ranging rounds, followed by groups of 10 bombs. Don't wait for the group. If you are in the middle of the bracket, MOVE. The 81-mm mortars are usually located in pairs, the 50-mm in threes.

(c) Antitank rifles are usually placed together in groups of three; antitank guns in pairs, or threes, sited back to back.

14. GERMAN TACTICS ON THE MARETH LINE

The following are some brief British notes on the tactics employed by the Germans in counterattacking on the Mareth Front, March 21 to 23, 1943.

* * *

In the attack by the enemy on several of our positions, tanks were not used in direct cooperation with the infantry. A maximum of 20 tanks was seen at one

time, and after proceeding for a short distance they split into groups of 3 tanks each. They were always attempting to get to our flank. The tanks operated in bounds, working from one hull-down position to the next, and stopping at each to shell and machine-gun our positions.

After detrucking under cover of palm trees, the infantry stealthily worked its way forward by making clever use of the ground. Snipers were very active, and covered the advance of the infantry very efficiently. The infantry objective at all times appeared to be to gain possession of commanding ground from which our positions could be overlooked and made untenable.

The enemy made great use of mortars as a preparation for his attack. His fire was extremely accurate and intense and his OP work seemed to be excellent. The Germans made frequent use of tracer bullets to indicate targets for their heavier guns farther back.

On one occasion after the capture of an enemy position by our troops, a success signal (British) was given. The enemy was observed to immediately send up a white Very light and his artillery opened on the newly captured position.

Reports indicate that the enemy did not use the former French pillbox defenses except when driven out of open positions. However, there are some indications that the pillboxes were used for infantry weapons. In the concrete, unroofed emplacements 20-mm, 25-mm, and 47-mm guns were used.

In a company defense area, each platoon had either a 20-mm or 47-mm antitank gun and several machine guns. The enemy made full use of the old communication trenches.

15. BRITISH OBSERVATIONS ON FIGHTING IN BURMA

In response to questions submitted by Headquarters, U.S. Army Ground Forces, the British recently sent in, with other information, the following notes on Japanese battle tactics.

*　　*　　*

a. General

The Jap seldom exposes himself to any fire. His trenches are narrow and irregular. He will not be shot out by artillery, bombed out by air bombing or killed by machine-gun fire. He is only to be killed by direct hits with mortar or with grenades. You can surround him but you will have to starve him out or kill him. He will throw grenades until his last breath; many dead Japs have been seen with grenades in their hands.

Jap weapons are copies of modern ones, but are not as good as those of the Allied Nations. Troops should know that our arms are better, and that they can use them better, but that they must see the Jap, hunt him out, and kill him. If you can get the Jap out of his hole, you can see that the smelly rat is no superman, but a small, dirty skunk, who will fight. The whole difficulty lies in hunting him out.

b. Patrols

(1) Our Own

Soldiers should know Japanese methods when undergoing training. They must be taught to slowly and noiselessly approach an area known to be occupied by the enemy. They must lie out in no man's land 1 or 2 days, and listen and look in order to spot enemy positions. The Japs are very patient at this, and so we must be, for we must out-smart and out-fight them.

(2) Japanese

The Jap is known to approach noiselessly and stay in close proximity to the British positions during the day and night. He may be away from his unit a day or two, but when he gets back, he has information.

Jap reconnaissance patrols often consist of only one or two men. They approach close and then listen. They overhear men talking in their trenches and personnel using the telephone. When the information desired has been obtained, they slip back to their own lines and then shoot up British positions. Even when they are on the defensive, they are as obstinate and tireless as they were when attacking. Jap troops for <u>some hundreds of yards</u> in rear of their own front lines talk in whispers or not at all. Indian troops jabber all the time, and cough and spit a lot. Those who do this are causing the death of their comrades, for the Jap is always near, looking and listening.

c. Health

Burma is one of the most unhealthful areas in the world. Malaria and cholera are always present. Simple scratches and bruises are easily infected. Super training effort must be made to instruct and enforce personal hygiene, simple first aid, and camp sanitation before, during, and after operations.

d. Terrain

The terrain in Burma is flat in many places, with rice under cultivation. These flat areas are interspersed with low hills and navigable streams. It is on the low hills that there is heavy, thick jungle undergrowth where the Jap builds his defenses. These hills are the eyes of the enemy. He occupies them and covers the open areas with fire.

e. Climate

The climate is warm the year round, although not so hot during the "winter" months. The evenings during the winter are almost cold. During the monsoons, everything is wet all the time. Transportation on the roads is well-nigh impossible, and the only routes available are streams and rivers. Since roads are few and poor, there is a lot of long and hard marching ahead of the troops who are fighting in this area.

f. Operations

Operations will probably consist of attacking villages and attacking low hills heavily protected with tropical undergrowth. Patrol and infiltration tactics will predominate. They must be continuous, and at night the only direction aid will be that of the compass. The Japs fire mortar and artillery as soon as the British open up, and also, to conceal their own locations and intentions, fire again at approximately the time of impact. They use every ruse imaginable to draw automatic and mortar fire in order to locate the positions of weapons. Strict fire discipline must be maintained, or the Japs will soon know your exact location.

16. JAPANESE MORTAR RANGING BY TRACER FIRE

A novel method of adjusting on, or indicating, target to mortars has been reported to be introduced by the Japanese in Burma. Two machine guns are sited on the target and open up with tracer. About 30 seconds later, the first mortar bomb falls, being aimed at the intersection of the two tracer streams.

Although a certain amount of organization and training is necessary for the operation of this system of target indication, it is considered to have the advantage of being able to spot and indicate targets which could not be observed from a fixed observation post.

ORDNANCE

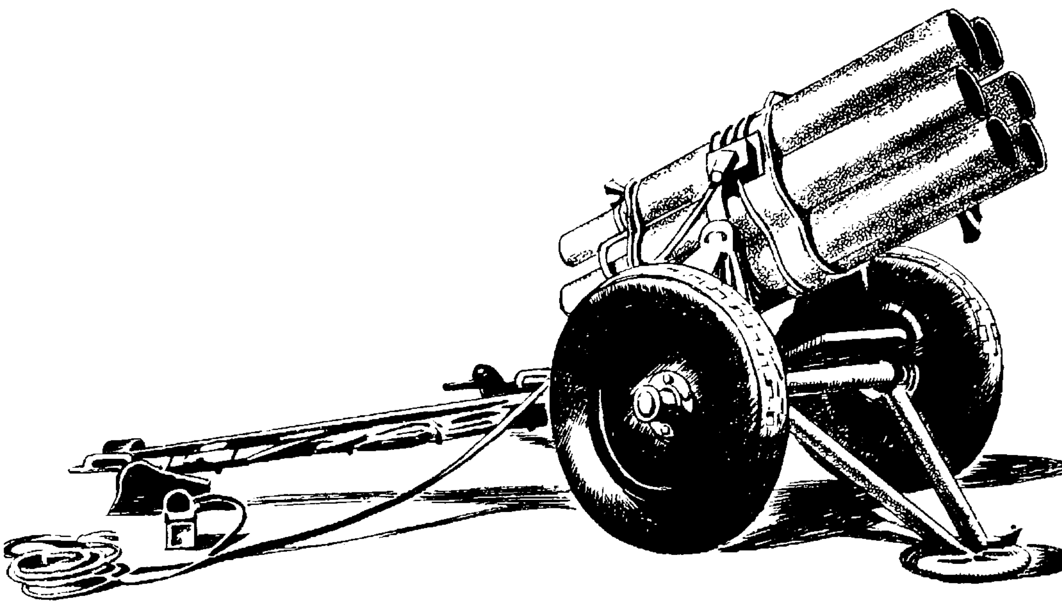
17. GERMAN 150-MM ROCKET CONSIDERED INEFFECTIVE BY BRITISH

From a recent British source comes the following information under the heading "Epitaph to a Secret Weapon."

The British Eighth Army has described the 150-mm smoke mortar (Nebelwerfer 41*), in official reports, as being "in effect noisy but negligible." In recent operations the Eighth Army has encountered HE fire from this weapon and the reporting officers have described it as:

*While referred to by the Germans as a "smoke mortar," this weapon is actually the six-barreled rocket projector--see Tactical and Technical Trends, No. 10, p. 23 and No. 17, p. 39.

(1) Not effective in blast;
(2) Not effective in fragmentation;
(3) Quite effective in noise.



NEBELWERFER 41

One of the reports states that no effect was felt at a distance of 60 yards from the burst. No reports of the ammunition, other than HE, used in this weapon have been received. The Schwere Wurfgerät, having a higher charge/weight ratio, should prove more effective. The latter is a heavy, rocket-bomb thrower (see Tactical and Technical Trends, No. 8, p. 28) projecting a 181-pound HE bomb.

18. SAFETY PRECAUTIONS FOR JAPANESE "91" GRENADE

Tests recently carried out with a number of captured Japanese type-91 hand grenades show that these weapons, so much in favor with the Japanese, might well cause more harm to the thrower, unless properly handled, than to the intended victims.

Although the delay fuze of the grenade is supposed to be 4 to 5 seconds (and is so marked), the delay train has been known to burn in much less time. All our troops, therefore, who capture these grenades and use them, should be informed that they must be thrown immediately after the head of the grenade has

been struck. (This grenade is armed by giving the head a sharp tap.)

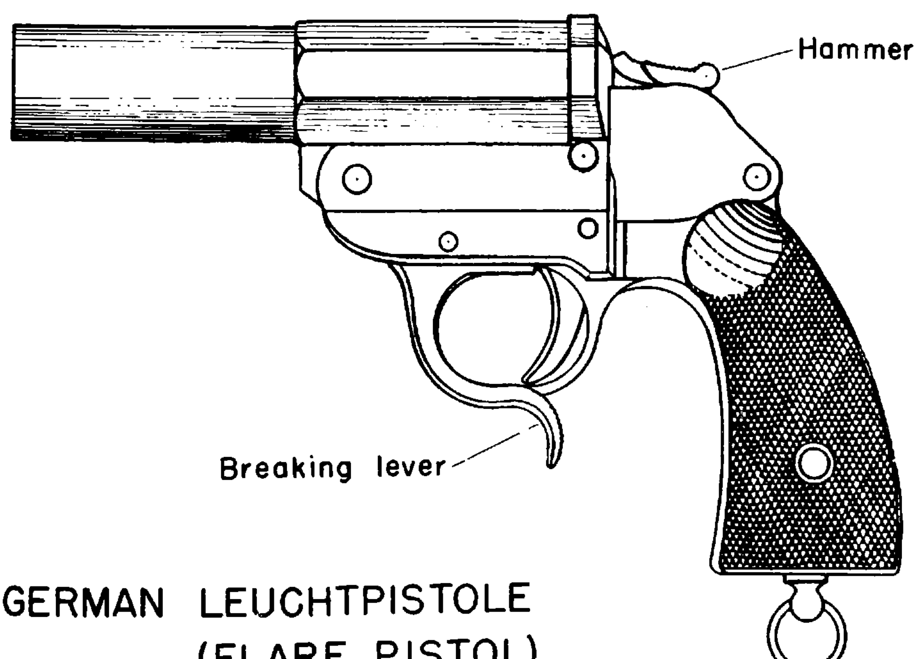
While the delay train is burning, a considerable quantity of black smoke is emitted from the escape hole at the base of the fuze tube. Care should be taken to keep the hand clear of this hole. This smoke emission serves as a feature in recognizing the grenade when in flight.

19. HE GRENADES FOR GERMAN SIGNAL PISTOL

The Germans have developed two HE grenades which can be fired from the signal pistol. The probable existence of these adaptations converts the signal pistol into an offensive weapon, although, to use an old frontier expression, it must "kick about as hard as it shoots." Nevertheless, from the description of the equipment, it would appear to be a compact and most useful auxiliary weapon for close-range fighting.

These grenades have been developed for engaging close targets which cannot be dealt with satisfactorily by infantry weapons or artillery without endangering friendly troops.

They are designed to be fired from the standard German Leuchtpistole



GERMAN LEUCHTPISTOLE
(FLARE PISTOL)

or flare pistol (see Tactical and Technical Trends, No. 23, p. 38.) It appears that the grenades can also be used with the rifled version of the flare pistol. The

latter is known as the Kampfpistole and is fitted with a sight. Both pistols are about 10 inches in length, with a barrel approximately 6 inches long. They are very light, weighing just over 1 1/2 pounds; the caliber is 27 mm. In addition to the two grenades described below, it is reported that the Kampfpistole fires a small nose-fuzed HE grenade, weighing about 5 ounces, with a maximum range of around 100 yards.

a. 2.6-cm Wurfgranate Patrone 326 Leuchtpistole*

The complete round looks like an 8-gauge, conical-ball elephant load in a brass shotgun shell (see figure 1) with the bullet painted yellow. The projectile has the appearance of a miniature mortar shell.

The weight of the complete round is approximately 4.23 ounces, with the projectile weighing about 3.2 ounces. The bursting charge is approximately .25 ounces (108 grains) of TNT; the propelling charge, .105 ounce (26 grains), presumably of rifle powder.

This "mortar shell" has a range of over 300 yards. Since at extreme ranges the dispersion is considerable, it is best not to fire at ranges above 200 to 250 yards. This ammunition can also be used at shorter ranges, such as direct fire on windows and embrasures in street fighting. Similarly, in wooded country it may be used against snipers in trees. Fire at ranges under 50 yards is reported to endanger the firer himself as well as his own troops, because of fragmentation.

As will be seen from the sectional sketch, the internal structure of this bomb is quite unusual, and instead of the firing pin hitting the cap, the cap hits the fixed firing pin in the nose of the bomb. The detonator and bursting charge are enclosed in a case, free to slide forward except for the restraint of the creep-spring, when the safety rod has been removed. The safety rod pushes sideways two metal balls which prevent the bursting charge container and the detonator from moving forward against the fixed firing pin. When fired, the safety rod falls out when the projectile is 10 to 12 yards from the muzzle; the projectile is then armed. On impact, the container drives forward against the fixed pin.

Anyone attempting to use captured equipment should very carefully observe these precautions:

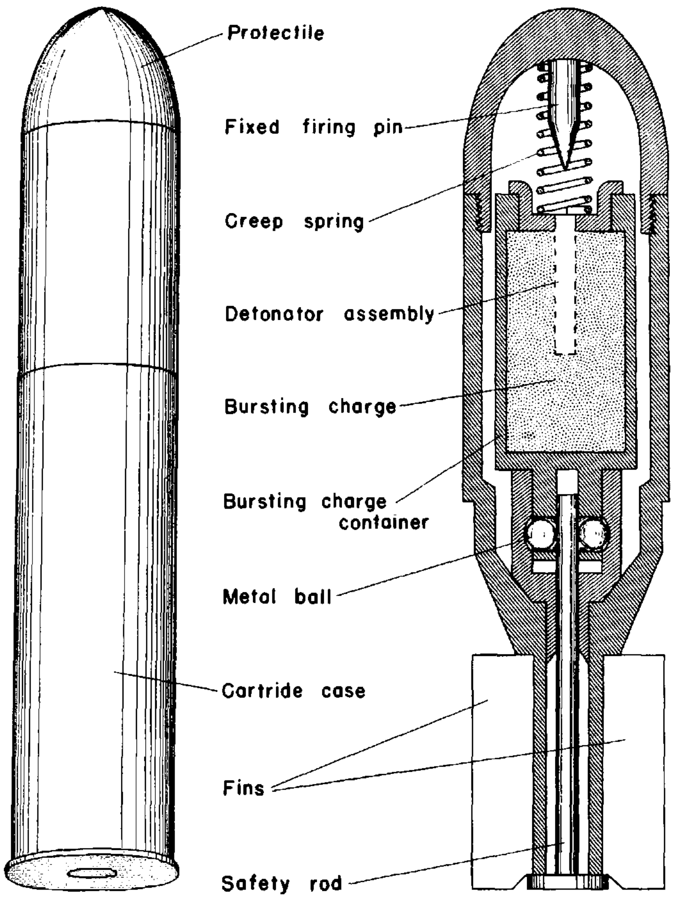
(1) Never fire a cartridge in which the projectile is loose.

(2) Absolutely never extract the projectile from the cartridge case, since this would cause the safety rod to fall out, and this would arm the projectile. A slight jar might cause it to detonate.

(3) After firing, the pistol is broken and the empty cartridge case removed.

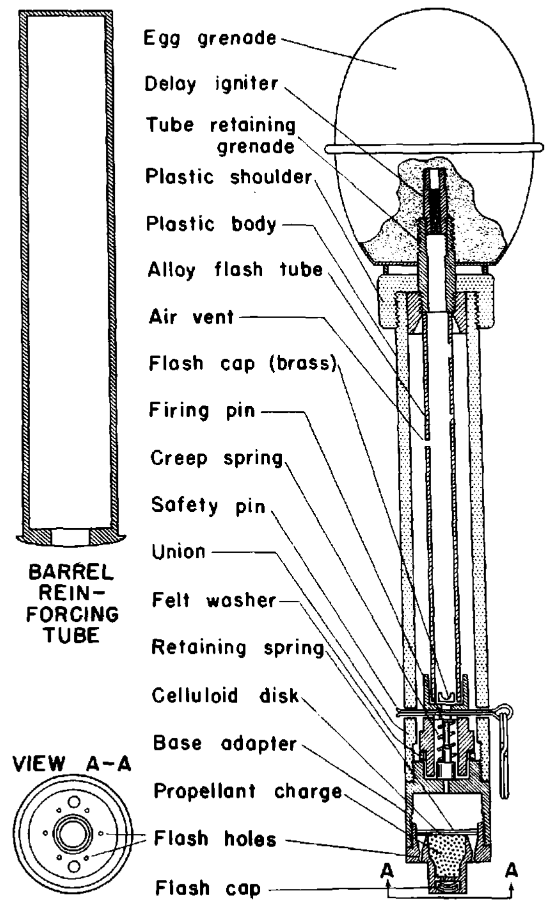
(4) If the bomb sticks in the barrel for any cause (this might happen with

*26-mm mortar shell ammunition "326" for flare pistol.



Protectile
Fixed firing pin
Creep spring
Detonator assembly
Bursting charge
Bursting charge container
Metal ball
Cartride case
Fins
Safety rod

FIG. 1



BARREL REIN-FORCING TUBE
VIEW A-A
Egg grenade
Delay igniter
Tube retaining grenade
Plastic shoulder
Plastic body
Alloy flash tube
Air vent
Flash cap (brass)
Firing pin
Creep spring
Safety pin
Union
Felt washer
Retaining spring
Celluloid disk
Base adapter
Propellant charge
Flash holes
Flash cap
A
A

FIG. 2

a foul pistol), never pull the cartridge case out of the breech. By inserting the pistol ejector in the muzzle, carefully press the whole round from the muzzle towards the breech and out from the breech end of the barrel.

b. Wurfkorper 361 Leuchtpistole*

Based on the standard German egg grenade, this ammunition is rather a more powerful weapon than the "mortar-shell" grenade. It has a range of 75 to 85 yards and is particularly suitable for engaging islands of resistance in towns.

The projectile consists of the normal egg hand-grenade with a stem screwed firmly on in place of the combustion fuze 39 for egg hand-grenades (see figure 2). The plastic stem contains a combustion fuze (combustion time is approximately 4 1/2 seconds), on the upper end of which a detonator is fitted. The fuze is inserted into the detonator and the latter into the grenade. In the lower end, the projectile carries the cartridge (propellant charge with percussion cap), which expels the projectile on firing and sets off the combustion fuze. The projectile is secured in the stem by a cotter pin and ring, which must be withdrawn before the projectile is loaded into the signal pistol. The projectile is then "live."

For firing the projectile, a barrel reinforcing-tube or cartridge-adaptor is inserted into the barrel of the pistol. It is pushed in from the rear when the pistol is broken. When the barrel is returned to position, the pistol is ready for loading. The barrel reinforcing-tube should be cleaned about every 100 rounds.

The stem of the projectile is introduced into the tube until appreciable resistance shows that the base of the tube has been reached. The pistol may now be cocked.

c. Instructions for Firing**

During firing, the arm is slightly bent. After continual firing, the arm becomes tired, with consequent decrease in accuracy.

The target can be aimed at only roughly along the barrel. Elevation is given to the barrel according to the range (maximum range with an elevation of 45°.)

The "egg-grenade" ammunition is usually employed for high-trajectory fire, since this is suited to its fuze time.

The "mortar shell" ammunition is used mostly for flat trajectory fire. The point of aim is the center of the target up to about 100 yards, but beyond this, it is necessary to aim higher. The projectile must strike full on its nose to detonate.

*Projectile "361" for flare pistol.
**These have reference to the smooth-bore pistol. Presumably instructions for the rifled pistol are essentially the same, though rifling and the provision of a sight would appear to make for greater accuracy.

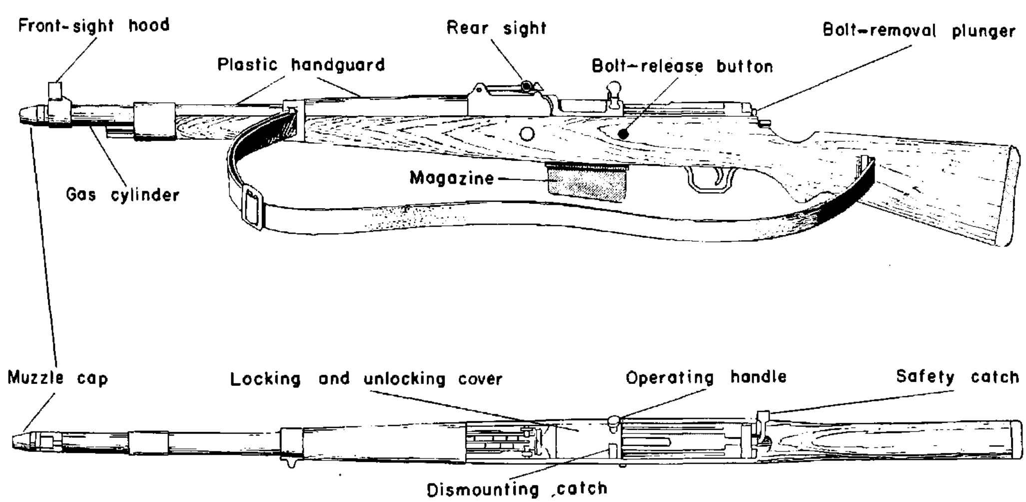
20. NEW GERMAN SEMIAUTOMATIC RIFLE

a. General

Recent shipments of captured enemy ordnance equipment from North Africa included two specimens of the new German 7.92-mm (.312 in.) semi-automatic rifle, the G. 41*. It is a gas-operated, 10-shot, magazine-fed shoulder weapon weighing 10 lbs. 14 oz. The over-all length is 45 inches, the length of the barrel 22 inches.

b. Functioning

It is operated by having the muzzle blast trapped by a cone-shaped muzzle cap and directed against a gas piston in the gas cylinder. The piston is in the form of a collar which fits around the barrel. This piston impinges against a



GERMAN 7.92-MM SEMIAUTOMATIC RIFLE

light piston rod which is located over the barrel under a plastic hand guard. The rear of this piston rod contacts the movable locking and unlocking cover on top of the bolt. This cover is connected to the firing-pin housing which is housed within the bolt assembly. As the cover is driven rearward 9/16 inch by the piston rod, it pulls the firing-pin housing back, causing the two movable locking lugs in the bolt head to be withdrawn from the locking recesses in the receiver by a camming movement. The bolt is then free to move, and residual pressure in the barrel drives the bolt rearward, ejecting the spent round and cocking the mechan-

*Gewehr 41--Rifle 41.

ism. As the bolt moves to the rear it also actuates the hammer, compressing the hammer spring and causing the hammer notch to be engaged by the sear. After the bolt stops its rearward motion, it returns forward under the impetus of the compressed recoil-springs in the bolt body, strips a new round from the magazine, and inserts it into the chamber. As the bolt closes, the two locking lugs are driven sidewards through holes in the bolt-head into the locking recesses in the receiver walls by the camming action of the firing-pin housing. Positive locking at the moment of firing is ensured by cams cut on the firing-pin housing, which make it necessary for the locking lugs to be clear of the firing-pin housing before the firing pin can contact the primer of the round in the chamber.

c. Sights

Sighting equipment consists of the usual German open-V-notch rear sight mounted on a leaf sliding on a ramp for elevation. The rear sight has no adjustment for windage. The front sight is of the normal inverted-V-type and is shaded by a hood, as in lately manufactured German bolt-action rifles.

d. Miscellaneous

Feed is from the top, using two of the ordinary 5-round Mauser clips. The rifle takes a short knife bayonet. It uses the standard 7.92-mm (.312 in.) German rifle ammunition.

There are many stamped parts, making for ease of manufacture, but the receiver and bolt mechanism require rather intricate machining.

GENERAL

21. JAPANESE NATIONAL FESTIVALS

Since 1937 there has been a great increase in the number of Japanese days of commemoration and celebration, but most of them have been made the excuses for special drilling, assemblies, or labor effort, rather than for relaxation.

A distinction should be drawn between (a) national holidays which are officially designated and observed with appropriate flag display throughout the empire, and (b) festivals which are observed by popular custom by some or all of the people but have no official government recognition.

Before the war (1937) there were 12 official national holidays. Since then there has been an increased emphasis upon military celebrations, and all events relating to the Imperial family, such as birthdays, death days, etc.

The following is a list of the more important Japanese national holidays:

January 1, New Year's Day

January 3, Emperor celebrates opening of New Year - the event being called Genshisai

January 8, Beginning of the Army year

February 11, Anniversary of accession of the Emperor Jimmu, and the founding of the Empire (Kigen Setsu) (this date as well as the year to which the founding is assigned--660 B.C.--has, of course, no foundation as an anniversary in fact)

March 6, Birthday of the Empress

March 10, Army Day (anniversary of Battle of Mukden, 1905)

March 20 or 21, Spring Equinox Festival

April 3, Anniversary of the death of Emperor Jimmu

April 29, Emperor's Birthday (this day is always especially associated with the Army; in peacetime it was marked by elaborate military reviews in Tokyo)

April 30, Festival of Yasukuni Shrine

May 27, Navy Day (anniversary of the Battle of Tsushima, 1905)

September 23 or 24, Autumn Equinox Festival

October 17, Kannamesai, or Imperial Thanksgiving of Autumn

November 3, Commemorative festival for the Emperor Meiji

November 23, Niinamesai, or Autumn offering to the Imperial ancestors

December 8, Great East Asia Day

December 25, Anniversary of the death of Emperor Taisho

Since September 1939, the Japanese have been required to observe "Greater Asia Commemoration Day" (Koa Hoko bi-- 興亜奉公日) on the first day of each month, a day of national self-denial in honor of the men fighting for Greater Asia. On this day there was to be no smoking, drinking, etc. After the attack on Pearl Harbor, the day for commemoration was altered to the 8th day of each month.

The Yasukuni ceremonies have assumed major importance, because on these occasions the soldier dead are enshrined and deified. This is the great reward which makes all the sacrifices seem bearable to the people at large. This is the only occasion throughout the year when the Emperor bows to the tablets and spirits of dead subjects who have become minor gods in the spirit world. The actual ceremonies last 3 days, beginning April 30; the relatives arrive from all parts of Japan throughout the preceding week, during which entertainment is provided for them. The second, less important of the semi-annual Yasukuni Shrine Festivals takes place on October 22 or 23.

It may be worthy of note that the public is never told of the true extent of Japanese losses, but that the announcements of names to be enshrined at Yasukuni are designed to give popular impression of low losses. Furthermore, announcements include the names of soldiers who died in the Meiji and Taisho periods as well (1868-1926), thus making the announcements obscure and uncertain, and impossible to check.

22. NOTES ON JAPANESE FORCES ON ATTU*

The Japanese plan of defense for Attu Island was to defend the high ground to the rear of each bay area. Only limited beach defenses were planned. This high ground ranging from 1,000 to 2,000 feet in height is irregular, rocky, snowbound at this season (May), and almost continuously shrouded in clouds and fog. Out-numbered, outgunned, and outflanked, the enemy defense became a delaying action with an orderly withdrawal to the Chichagof Peninsula for a last ditch stand.

The original Japanese installations were largely concentrated in the Holtz Bay--Chichagof Harbor areas. Valleys from both sectors lead inland to high passes which in turn lead down to Massacre Bay and Sarana Bay. These passes thus became the keypoints of the Japanese defense against attack from the rear.

*See map on page 40.

The original American landing was at Blind Cove behind the high ground NW of Holtz Bay. The two main American forces landed, however, at the northern end of the beach at the West Arm of Holtz Bay and at Massacre Bay to the south. These landings were unopposed, and our troops and supplies were put ashore without casualties, although intense fog slowed up operations. Naval gunfire was of great assistance in neutralizing enemy positions at the head of Massacre Valley and in keeping the enemy under cover in the Holtz--Chichagof area. Weather curtailed air operations during the initial phase.

Certain general observations on Japanese ground tactics can be made. The Japanese counterattacked in small groups with reckless abandon, even when the odds were very much against them. They attempted infiltration tactics (again favoring small groups) but with less success than in Southwest Pacific jungle fighting. As might be expected, harassing fire by Japanese snipers was encountered in all sectors. Enemy rifle fire was accurate only at extremely short ranges, but excellent camouflage and smokeless, flashless ammunition made snipers hard to locate. (Actually the powder is not "flashless." It is true that the Japanese 38 year (1905) pattern rifle shows no flash when fired at night. However, this is caused not by the flashless properties of the powder but by the long barrel (31.5 in.), which results in the complete combustion of the powder before it reaches the muzzle. The smaller powder charge and lighter bullet combine to give a lower muzzle velocity, which also helps to eliminate flash. Flash is present in Japanese machine guns, carbines, and short rifles because some still-burning powder is blown out of the muzzle of these shorter-barreled weapons, proving their powder is not actually flashless.)

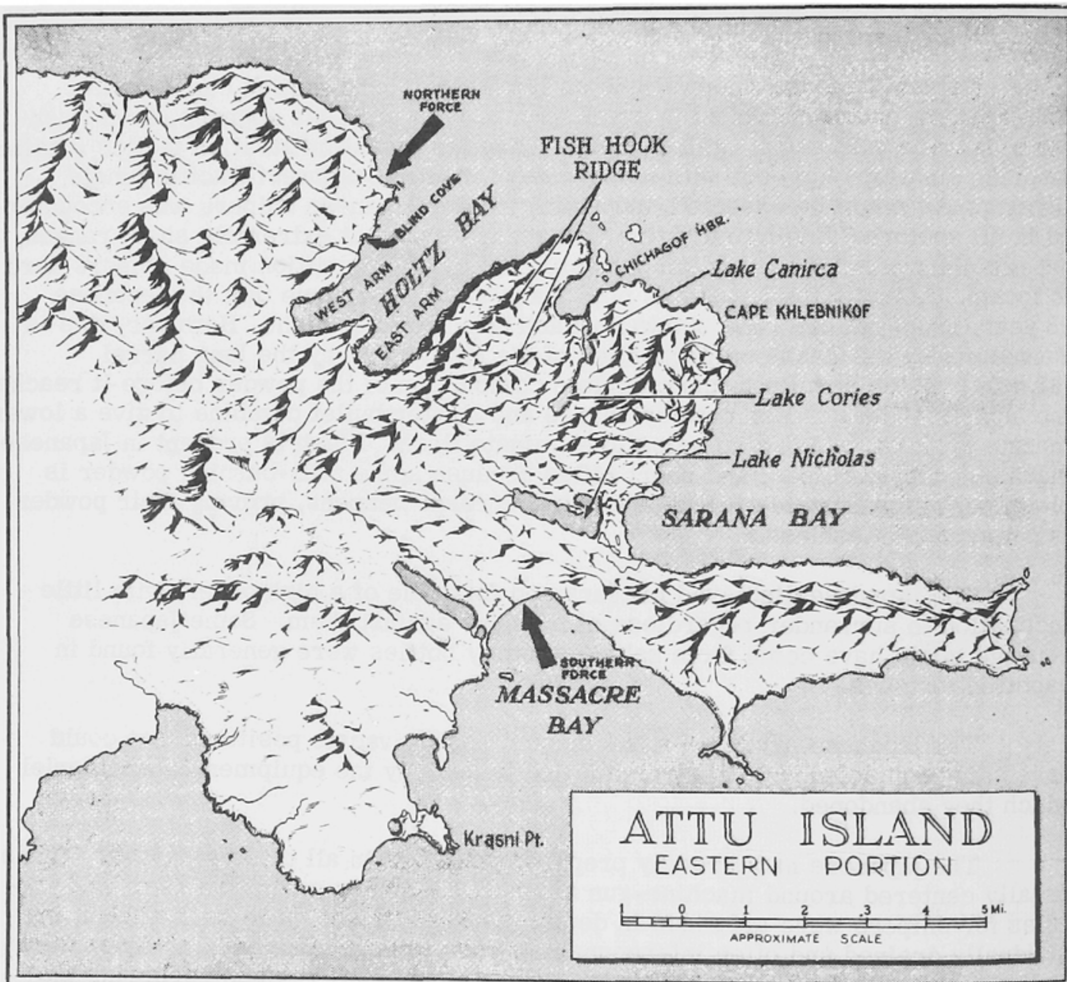
The Japanese displayed bravery and fortitude of a high order, with little inclination to surrender regardless of the odds against them. Some Japanese courage might have come from sake, as empty bottles were generally found in captured foxholes.

The Japanese exhibited a tendency to hastily vacate positions that could have still been defended. They also failed to destroy the equipment and materiel which they abandoned.

The Japanese had strongly prepared positions in all the key passes. These usually centered around machine-gun nests, but mortars were also used, and foxholes for snipers were arranged in depth. These foxholes were well-hidden, individually drained, and often interconnected with underground tunnels. They were well stocked with food and ammunition. Caves and small ravines bordering the passes became effective enemy strongpoints. The enemy made excellent use of the cover of clouds and fog, and the resultant limited visibility. This limited visibility aided enemy camouflage, prevented our estimating Jap strength, and restricted our air support and supply operations. In general the attacking Americans had to flank and overcome each position in hand-to-hand fighting using bayonets, rifle butts, and hand grenades. Most of the fighting in the higher areas was above the snow line, where the enemy made extensive use of short skis. American attacks usually followed considerable night patrol activity intended to locate weak points in the enemy positions. Effective artillery fire sometimes preceded Ameri-

can assaults. One enemy strongpoint was taken after scaling a 60-degree slope.

Japanese positions around the West Arm of Holtz Bay were so well prepared as to indicate an attack in that sector might have been expected. The trenches, dugouts, rifle pits, approaches to gun emplacements, and covered tunnels were effectively camouflaged. On the East Arm the air strip was found nearly completed. Hand labor had generally been employed, but two gas rollers and a Chevrolet-type truck with rear roller wheels were found. Push carts on narrow-gauge rails, and rickshaw-type wheel barrows, were found.



The enemy was well equipped and supplied at the beginning of operations. He is believed to have had around 2,100 troops on Attu. He used standard Japanese uniforms (our aviators reported difficulty in front-line differentiation between American and Japanese troops). The enemy had wool and worsted short coats, kersey-lined trousers, and heavy sheepskin parkas. He had raincoats and rubber boots, and blankets of good grade although they were only 3 by 5 feet in size. Among captured weapons was a 3-inch AA gun, individually sighted and not director controlled. These guns effectively used time shell with a low air burst.

Several were captured and restored by American troops who then used them against the Japs. Also captured were many mortars, "knee" mortars,* and Nambu light machine guns. The enemy is believed to have used 75-mm howitzers and 70-mm guns in defending the Holtz--Massacre pass. The enemy had many light and heavy machine guns and grenade throwers, and also medium artillery pieces. In the Chichagof Harbor area where he had fixed AA guns, he turned them against American ground troops. One captured strongpoint had been occupied by an enemy rifle platoon, machine guns, and a field piece. Enemy AA activity came mainly from the Chichagof area, where he was dug in along the beach, and among the buildings at Attu Village. In the AA machine-gun fire thrown up at our planes, many red tracers were noted. The most effective Japanese weapons were grenade launchers, mortars, and AA guns.

The Japanese on Attu were isolated after the American landing on May 11. The only known supplies that they received were in the form of two packages dropped from one of the Jap planes over Chichagof on May 22.

Enemy buildings were mostly used for storage. Salvage and reclamation tactics of the Japanese were apparently poor, as several slightly damaged barges were captured that they had made no attempt to salvage. The dimensions of the captured barges were: length (ramp up) 48 ft. 4 in.; ramp down 49 ft. 4 in.; beam 11 ft. 3 in.; inside of ramp, 7 ft. 8 in. These barges had a double keel and were extremely sturdy. Japanese tents were 11 feet high and 24 feet in diameter, and housed 30 men. Several damaged planes and 9 airplane engines were found in poor condition at Holtz Bay, where they had been stored on the beach for several months. The Jap ration included dried squid, canned salmon, beans, rice, dried potatoes, canned emergency rations, duck, canned mandarin oranges, fresh fish, and seaweed. Strings of freshly caught cod were found. Very large quantities of fresh vegetables, dried foods, ammunition, blankets, rifles, charcoal, and clothing were captured intact in the Holtz Bay area. In fact so much in the way of supplies was captured that it would be logical to suppose the Kiska had been receiving supplies from Attu.

*Actually this is not a "knee" weapon. It is a 50-mm grenade launcher with a small base plate designed to rest on the ground or any solid object.

SECTION II

THE FORCING OF THE NAREW RIVER CROSSING

THE FORCING OF THE NAREW RIVER CROSSING

The following translation from a German military review gives an account of the German crossing of the Narew River at a point about 100 miles northeast of Warsaw on June 25, 1941. The account illustrates very concretely the German methods employed in a small tactical operation. Of special importance in the success of this action were: The effective combined use of the various arms (particularly supporting artillery); the flexibility of control, which permitted rapid adjustment of tactical plans to meet a changing situation; and, finally, the offensive spirit that characterized the whole operation.

The Vorausabteilung (advanced detachment) is to be distinguished from the Vorhut (advance guard) and operates in front of the latter. It is formed to carry out specific tasks connected, at least partly, with combat reconnaissance. Its size and composition are flexible. In the action described below, the Vorausabteilung is converted into an Angriffsgruppe (attack group), prior to the general attack.

A map will be found at page 48. The translation follows.

* * *

THE GERMAN PLAN OF ATTACK FOR JUNE 25

The 499th Infantry Regiment, reinforced, advancing by forced marches, had supported the advanced detachment (Vorausabteilung) of the division in its defensive engagement with enemy* tanks attacking west of Rajsk. On the evening of June 24, the most advanced elements of the regiment had reached the Orlanka crossing at Chraboly without any important contact with the enemy. Orders were issued for the regiment to advance the next morning on Ryboly, located north of the Narew. It was assumed that the enemy would evacuate the Orlanka sector and withdraw behind the Narew in the direction of Bialystok (about 15 miles north of Ryboly).

An advanced detachment (Vorausabteilung) for the regiment was formed, consisting principally of the 9th Bicycle Company, a platoon of engineers (Pioniere), and an assault gun platoon.** This detachment was to assemble at Banki at 0600, proceed by way of Rajsk and the Orlanka bridge at Chraboly, take possession of the Narew crossing 3 kilometers southwest of Ryboly, and keep this crossing open for the regiment coming up from the rear. The regiment was to follow the advanced detachment in such a way that the advance guard, consisting of the 3d Battalion (less the 9th Bicycle Company), one platoon of light infantry howitzers, one antitank platoon and one cavalry squad,† was to reach the hill 1 kilometer northeast of the Narew bridge as its first objective, while the main body was following at a distance of 2 kilometers.

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*"Enemy" of course from the German viewpoint. Throughout the translation "enemy" has reference to the Russians.

**Probably two 75-mm self-propelled guns.

†The infantry regiment includes a mounted infantry or a cavalry platoon, consisting of a headquarters and 3 squads.

Plans for the support of the advance across the Orlanka River were as follows: strong artillery, emplaced at Rajsk, was to be put into readiness for action; from its bridgehead positions at Chraboly, the 2d Battalion (reinforced) was to cover the crossing of the advanced detachment; a battery of assault guns was to be attached to the advanced detachment to cover the advance beyond the Orlanka.

THE ADVANCED DETACHMENT REACHES THE NAREW

The reinforced 9th Bicycle Company (the advanced detachment) arrived at the Chraboly bridgehead at 0730. Inasmuch as the battery of assault guns which had been ordered to the Chraboly bridge had not yet arrived, the company waited. Not until 0815, upon arrival of the assault-gun battery, did the advance detachment start on its march, assault guns ahead.

The forward reconnaissance elements very soon reported that a weak enemy force with machine guns was holding the southern edge of the woods south of the Narew crossing. At 0830, the assault guns, with the most advanced elements of the 9th Company, reached the enemy-occupied edge of the woods and attacked with the object of throwing the enemy across the Narew and seizing the hill north of the crossing.

Effectively supported by the assault guns and the antitank platoon, the company succeeded in throwing the enemy back; a few isolated individual Russian soldiers continued to fight stubbornly in the woods. The main enemy force withdrew to the east and harassed the 9th Company from that direction by means of rifle and machine-gun fire. The company reached the north edge of the woods and found itself before the bridge and the hill to the north, both occupied by the enemy.

Meantime, the advance guard (reinforced 3d Battalion), having been somewhat delayed by skirmishes with enemy snipers, had been late in arriving at Rajsk. In order that the march of the main body should not be held up because of this delay, the regimental commander ordered the main body to close up on the advance guard without regard to the prescribed distance of 2 kilometers. The regimental commander went to the northern bank of the Orlanka, where the reinforced 2d Battalion was assembling most of its elements, the remainder continuing to cover the Orlanka crossing. There, the message from the 9th Bicycle Company reached him saying that it was attacking weak enemy forces at the edge of the woods south of the Narew bridge and that the Narew bridge was occupied by stronger enemy units.

Thereupon, all available mobile forces, namely, one engineer company and one antitank company, were rushed ahead in order to reinforce the 9th Company, and were placed under command of the advanced detachment commander. By relentless attack, they were to force the crossing of the Narew and hold the hills beyond as a bridgehead until the arrival of the regiment. This movement of these reinforcements proceeded with despatch, and the regimental command post was moved forward to the hill 2.5 kilometers southwest of the Narew bridge.

ESTIMATE OF THE SITUATION (ABOUT 0900)

Here, two reports arrived. First, prisoners stated that the enemy was intending to defend the Narew. Their statements were at first regarded as incorrect, in view of the general estimate of the situation. However, a short time later an air observation report came in that enemy motorized forces were advancing on Zabludow from the northeast; this appeared to confirm the prisoners' statements.

The regimental commander now estimated the situation to be that the enemy was bringing up forces to defend the Narew southwest of Ryboly. He stuck to his plans of seizing the crossing from the enemy by means of a quick grab and decisive attack before the latter could bring up any stronger forces. To effect this plan, the approaching advance guard (3d Battalion) was ordered to attack immediately, from march formation, to the right of the road and to seize the hills beyond the Narew bridge. The 1st Battalion, which was closely following the 3rd, was to move forward rapidly and get into attacking position on the left flank of the 3d Battalion, with the same mission, namely, to seize the hill beyond the river as quickly as possible and hold it.

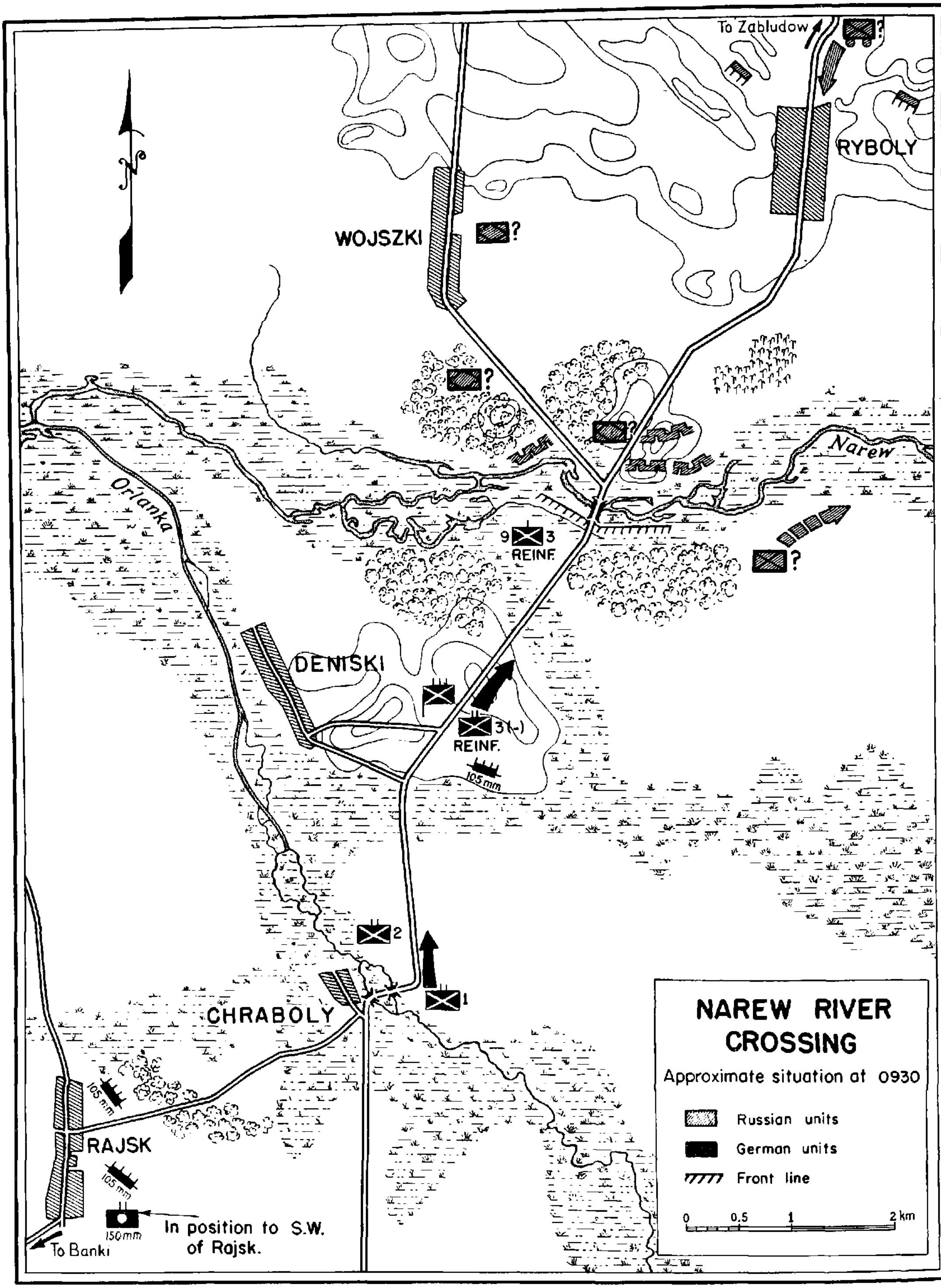
As for the artillery, one battery was moving to a position east of the new regimental command post; two batteries still were concentrated to the east of Rajsk, ready to open fire. They were to hinder the approach of the enemy motorized forces by means of interdiction fire on Ryboly. A battalion of medium artillery, a liaison officer of which reported to the regimental staff, was to fire on the road south of Ryboly so as to block the enemy's path to the Narew bridge.

THE ENEMY RESISTANCE IS STRONG (0930)

At 0930, the 3d Battalion reached the hilltop at the command post. According to messages reaching the regiment at that time, the situation in front was bad: the enemy had heavily occupied the hills beyond the river and was inflicting severe casualties, by means of rifle, machine-gun, mortar, and artillery fire, on the troops of the advanced detachment.

Thereupon, the regimental commander went forward himself and ascertained that enemy artillery, reckoned at one medium battery, was shelling the road south of the bridge as far as the regimental command post; some rounds even fell into the positions at Chraboly. The sound of battle indicated that the enemy was resisting stubbornly.

In order to force the attack forward, the regimental commander ordered one of the assault gun platoons to push at once to the far bank of the Narew and engage the enemy. Since signal flares, indicating enemy tanks, were now going up from the wooded area south of the bridge, this order was supplemented by special directions to destroy enemy tanks on the far river bank. An additional assault gun platoon received the same orders. The 3d and 1st Battalions were impressed, once more, with the urgent need for a quick advance. Meanwhile, enemy tank concentrations had been reported at Woiszki and in the woods to the



NAREW RIVER CROSSING
Approximate situation at 0930
Russian units
German units
Front line
0
0.5
1
2 km
To Zabludow
RYBOLY
WOJSZKI
Narew
9
3
REINF.
Orlanka
DENISKI
3(-)
REINF.
105mm
2
1
CHRABOLY
RAJSK
105mm
105mm
150mm
In position to S.W. of Rajsk.
To Banki

south, and were being engaged by the artillery.

At this time, messages were arriving from the advanced detachment saying that fire from enemy artillery, tank guns, heavy mortars, and infantry howitzers, in addition to well-aimed rifle fire, was preventing any forward movement. Some elements had got as far as the river; there, however, they had been stopped by enemy machine-gun fire. Consequently, though the assault guns were on the far bank, no infantry or engineers had reached it as yet. Artillery was therefore ordered to engage the enemy on the north bank.

The enemy artillery fire increased; it was estimated at 4 medium and 4 light pieces. Furthermore, it was reported that the enemy was installed in field fortifications on the far bank of the Narew, and that numerous tanks were engaging the attacking force. No report that the 3d Battalion had succeeded in moving forward was forthcoming. Likewise, the report that the assault guns had got across the river, expended their ammunition, and recrossed with more ammunition, could not change the general picture--that a continuation of the attack did not appear to promise success under the methods employed so far. On the contrary, it seemed possible that casualties would be augmented without the objective being reached.

Moreover, it was ascertained that the 1st Battalion had lost much time in its advance by deploying across open terrain and that it was still lagging behind; early assistance from this battalion was not be be expected. From the commanding hills, the enemy completely enfiladed the river--600 to 1,000 meters wide, level, and devoid of cover. Finally, the avenue of approach (particularly east of the road) was made difficult by extensive pools and stagnant channels, and the attacking force was not familiar with the crossing conditions on the Narew.

PLAN FOR A COORDINATED ATTACK TO FORCE THE NAREW

The plan of attack was based on the only existing possibility, namely, to seize the crossing by surprise, on, under, and beside the bridge. This naturally required some time, as this area in particular was under heavily concentrated fire from rifles, machine guns, rifle grenades, and tanks.

A coordinated attack had to be planned: the 1st Battalion had to come up, deployment of all elements be completed, and preparatory fires by artillery and heavy weapons laid down.

Therefore, oral fragmentary orders were issued to continue the attack only after systematic preparation and after guarantee of the strongest possible artillery support, as well as support by one antitank battalion. The following forces were to prepare for the assault, south of the Narew:

Right Front: 3d Battalion with one L Inf How Plat, one AT Plat, and the 1st AT Co, all attached.

Left Front: 1st Bn with one L Inf How Plat, one Hv Inf How Plat, and the 2d AT Co, all attached.

Angriffsgruppe:* The former advanced detachment (Vorausabteilung), with its attached units, in its present position.

Regtl Reserve: 2d Bn with one L Inf How Plat attached. This force was to reconnoiter possibilities for attacking from a position in the western section of the woods northeast of Deniski.

The commanding hills north of the Narew bridge were designated as the next objective of the regiment.

The main mission of the artillery was to support the 3d Battalion and to prepare the attack by smashing the enemy in the fortified positions north of the bridge; furthermore, to smash enemy tank concentrations south of Ryboly, in the woords southeast of Wojszki, and at Wojszki.

A CHANGE OF PLAN TO MEET A CHANGE IN THE SITUATION (1130)

Toward 1130 the situation took a new turn. The aggressive power of the attacking elements was able to accomplish what had not been considered possible in view of the estimated enemy situation, defending as he was a fortified position, with increasing artillery support and strong tank forces held in readiness.

By exploiting the bold forward thrust of the assault guns, elements of the infantry--about 20 men of the 10th Company--and parts of the engineers had succeeded in pushing to the far bank on and under the bridge, forming a bridgehead and thereby initiating a sweeping general attack across the Narew by the attack group.

Toward 1130, the reports from the liaison officers who had been sent to the units then attacking, (the attack group and the 3d Battalion) revealed the following situation:

The liaison officer with the attack group realized, upon his arrival, that there had been a change in the situation since the issuance of the order for a coordinated attack. It now appeared possible for the forward movement to gain sufficient momentum for a successful assault without a coordinated attack. He hurried to take this important news to the regimental commander.

The liaison officer with the 3d Battalion delivered a message from the 3d Battalion Commander indicating that his attack was in progress, some units already had succeeded in pushing across the river, and could not now be stopped. The most advanced infantry was involved in stubborn close combat with the enemy in foxholes and small trenches. If reinforcements could come up soon, the attack was likely to be successful.

*Attack group.

It was now imperative to prevent the attack from stalling; this was the moment to press forward with all available strength.

A considerable element of danger was recognized in the fact that, during the sweeping continuation of the assault, the attacking force might run into its own artillery fire. However, efforts to shift the fire to a box barrage succeeded in time; later, it turned out that the artillery fire had been falling directly in front of the infantry and had greatly facilitated the attack.

The liaison officers with the attacking units were rushed forward with the new and final order to dispense with any preparation for a coordinated attack and to press the attack now in progress, with the hill north of Ryboly as the next objective (3d Battalion to the right of the road, 1st Battalion to the left of the road).

SUCCESS

The regimental command post was moved forward to the hill north of the Narew bridge. This was done at a moment when the most advanced elements, generally speaking, had cleared the enemy positions on the hill to the right of the road. There were one or two dead Russians lying in every foxhole; now and then, shots were still being fired by some individual Russians who obviously had simulated death. Parts of the 3d Battalion turned east so as to clear the grain fields of enemy riflemen; other elements fought their way into the wooded rolling country 500 meters north of the Narew bridge.

Only a few tanks were still resisting; they were disabled by the assault guns, and some of them were abandoned by their crews.

The enemy had been forced to give up his intention of defending, both by the fierce attack and by the effective artillery fire, which had caught the enemy motorized column at Ryboly and tank concentrations at Wojszki and in the reserve position in the woods to the southeast, as well as the enemy artillery. While the most advanced enemy riflemen and heavy weapons, supported by tanks, were holding out until the last, everything else was in full flight. Enemy riflemen approximately two companies in strength were observed northwest of Ryboly in scattered retreat (seemingly, the enemy infantry reserve). The enemy artillery left some single guns behind, in their emplacements; the rest withdrew from Ryboly to the northeast and, caught in the pursuit fire of the medium artillery, were abandoned by the enemy north of Ryboly.

* * *

Comment: As in any contemporary account, based on incomplete records, one must allow here for the natural tendency to overestimate the achievement of friendly troops. The Russian strength is nowhere clearly indicated, and it would appear from the account that the German superiority in artillery was decisive, even against Russian tanks. Whatever the final judgement on this small engagement, it remains well worth study as an example of bold and rewarding offensive tactics in a difficult type of operation.

[redacted]

TACTICAL AND TECHNICAL TRENDS

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ARMY GROUND, AIR, AND SERVICE FORCES
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[redacted]

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SECTION I

AIR

1. ELEVEN MEN DIED -- WHY?

The following article is taken from the June 1943 issue of AFGIB (Air Forces General Information Bulletin). This was reprinted from the RAF publication Tee Emm and reconstructs the story of what happened to the crews of 3 Blenheim bombers lost in the Libyan desert.

* * *

Here is the tale of how eleven Air Force men died.

They did not die fighting against the enemy. Their deaths were not even remotely caused by enemy action. Yet they died one of the most horrible deaths known to human beings--slowly, by thirst.

Three Blenheim aircraft, each with a crew of four, took off from Kufra Oasis in the Libyan desert on a reconnaissance patrol. They carried out the patrol successfully and returned to base two and a half hours later. For some reason, however, they did not land, but flew away from Kufra again.

After half an hour one Blenheim force-landed with engine trouble and the other two followed.

Discussion of their position showed that they were lost, and one pilot took off and flew between south and west to look for base. He returned after half an hour having found nothing, and in the afternoon he took off again, this time flying south and east, but again unsuccessfully. During this time all three aircraft were transmitting by radio but got no answer.

According to the only survivor of the twelve, they had been so confident of being soon picked up that they did not ration their water. Thus as much as 20 gallons had been drunk by the following morning, when they started rationing. During the second day another pilot took off and flew north. Once more the flight was unsuccessful, as were all attempts to receive wireless messages.

On the third day another pilot tried flying west, this being the only direction unsearched. He did not return.

The water had given out that morning, and during the afternoon they broke open the compasses and drank the alcohol. They also used the fire extinguishers to keep themselves cool. As a result, they broke out in terrible blisters and sores.

Next morning the first man died. During the following 4 days, after suffering agonies of thirst and torment from having drunk the alcohol, which led one man to shoot himself, all the men had died but one, when at last the missing aircraft were located on the eighth day after they had been lost.

The search had been hampered by two things. First of these was lack of accurate information. The transmission from the aircraft was very weak but the direction-finder procedure of the three radio operators was poor throughout, and they evidently were not properly aware of the direction-finder procedure at Kufra.

The second thing was the bad terrain,coupled with sandstorms which prevented accurate observation from the air. On the other hand, the searching aircraft did not start operating till the fourth day, and though they then flew 9 hours daily, they were not working on a properly coordinated plan. The first proper, navigationally planned search was successful within 5 hours.

Now what were the causes of this ghastly and unnecessary loss of life-- this loss, too, of all the time and money expended on the crews' training, and this wasted war-effort of six searching aircraft and crews which might have been operationally employed?

Primarily it was bad navigation. It was basically due, as was afterwards proved, to the inability or slackness of any of the three navigators to keep a proper log. As a result, they had completely lost themselves half an hour's flying time from base. How completely they were lost is shown by the fact that they searched towards all four points of the compass for the base they had left but 30 minutes before. Blame also attaches to the radio operators, who did not work correctly their direction finder and so keep in touch.

Then when on the ground the crews, knowing they were lost, failed utterly to take their plight seriously, as anyone should who is engaged on desert flying. They did not ration water till it was too late. They made foolish use of the compass alcohol and the fire extinguishers. They failed to lay out any strips or make smudge fires, which might have guided the searching aircraft.

Even so, they might have been saved if the searching aircraft had cooperated promptly and methodically. For various reasons no search was made on the second day, and on the third and fourth days weather made proper search impossible. And for 3 days after that only vague sweeps were made, instead of navigationally planned searches.

Finally, it would seem that the tragedy was in great part due to poor leadership. A good flight commander would almost certainly not have allowed much of what did happen to occur. One gets the impression that the stranded men did more or less as fancy dictated or as they thought best after general consultation, instead of being made to work under the strict orders of their leader. In fact, the whole sad business might easily have been avoided in the first place if the flight commander had obeyed a standing order that during desert reconnaissance by a flight, one aircraft at least should remain on the ground; and again if, after carrying out the reconnaissance, he had landed his aircraft safely and not taken them off for half an hour on a completely unauthorized flight. But orders were not obeyed.

If even one life is saved in the future from knowledge and understanding of what happened, and why, then those 11 unhappy men will not have died in vain.

2. AN ITALIAN AIR FORCE ASSAULT REGIMENT

The formation of a so-called Assault Regiment in the Italian Air Force is announced in an article in the Popolo d'Italia of 2 May 1943.

* * *

The first Assault Regiment of the Italian Air Force, which bears the glorious name of Amedeo D'Aosta has been very recently established, and already one of its units has had its baptism of fire on the Tunisian front. Employed at a particularly critical moment, and for tasks which went beyond the limits of their specific training, the parachutists of the Italian Air Force have worked unstintingly, with great enthusiasm and a very high spirit of sacrifice.

This regiment is designed to operate in areas and sectors solely of air interest, and its tasks are essentially concerned with offensive and defensive actions in connection with installations, equipment, and services which are primarily for the air force. It also has organizing tasks, still for the air force, and generally concerned with the immediate reorganization of airfields abandoned by, or captured from, the enemy.

The Regiment consists of the regimental headquarters, the "Loreto" Battalion, a parachute battalion, and a depot company.

The regimental headquarters in addition to the normal duties and functions of similar units, such as administration, discipline, morale and general training, the employment of the personnel, and the care of material issued to units or of individual equipment, is responsible for directing the special training of the regiment with a view to the particular tasks which each of its units has to carry out; for ensuring the correct and complete application of the guiding principles issued by the higher authorities in order that the special methods of employment of the units may be applied in the best possible manner; for coordinating in the tactical sphere the employment of the several units in order that each may function smoothly, in particular when the operations of the various units have to be coordinated; and finally, for studying in the light of experience any matters which might improve the organization and efficiency of the units under its command, always from the standpoint of the tasks allotted to these units.

The "Loreto" Battalion is normally airborne and is responsible for garrisoning and defending airfields already occupied by Italian units or at any rate evacuated by the enemy; for organizing all the technical services of the airfield, making use of, and reconditioning, existing installations wherever possible in order to make the airfield operational; and for organizing all the supply and administrative services which are essential to the life and functioning of an airfield

The parachute battalion, normally dropped from the air, restores to use the landing area at occupied enemy airfields; cooperates with units of the other

services in the defense of the airfield, and organizes the necessary services with makeshift material pending the arrival of elements for manning and equipping the base.

The personnel of the "Loreto" Battalion may be obtained from volunteers or may be drafted to the unit. The standard of physical fitness is that normally required for conscript service with the colors. Only volunteers, on the other hand, may join the parachute battalion.

ANTIAIRCRAFT

3. THE ORGANIZATION OF GERMAN ANTIAIRCRAFT DEFENSE

a. General

Probably no (Allied) activity is causing Germany more acute military discomfort than the never-ending air attack on her factories, supply lines, and cities. These aerial attacks have forced the Germans to erect, in Berlin and elsewhere, sturdy concrete towers, 200 feet high, so that their heavy antiaircraft guns may be sited above the surrounding buildings; to build decoy streets, railroad stations, and even whole towns; to erect fake houses and streets over lakes; and, reportedly, to move whole industries into Czechoslovakia and other areas in the interior of Central Europe.

However, the basic air defense is "Flak." Below, from authoritative sources, is an outline of the whole German antiaircraft organization. For further information on this subject, see Military Intelligence Service Special Series, No. 10, "German Antiaircraft Artillery." For an account of the air-raid warning system, see Tactical and Technical Trends, No. 21, p. 3. We now deal with the actual antiaircraft artillery and searchlight organization--the "counterbattery artillery," used against the United Nations' air assault.

German antiaircraft artillery (Flakartillerie) forms part of the German Air Force and is under the control of the Air Ministry, with the exception of:

> Heeresflak (army antiaircraft) which, in addition to units organized on similar lines to German Air Force Flak, includes "Fla" (Fliegerabwehr, antiaircraft) units organized as motorized antiaircraft battalions and comprising light guns only.
>
> Marineflak (naval antiaircraft) which mans a proportion of the defenses in certain ports and coastal areas.

b. Organization

(1) General Organization

The German Air Force antiaircraft artillery is organized into the following units: Korps (corps), Division (division), Brigade (brigade), Regiment (regiment), Abteilung (battalion), Batterie (battery), and Zug (platoon).

The units are denoted alternately by Roman and Arabic numerals. Thus corps have Roman numerals, divisions Arabic, brigades Roman, regiments Arabic, and so on. Independent Abteilungen (i.e., not belonging to specific regiments) have Arabic numerals and constitute the only exception. Units are sometimes designated by name, usually that of the commander.

Organizations thus far identified include 2 corps (first heard of in the Battle of France), about 20 divisions, and a similar number of brigades. The main series of numbering, approximately 1-1,000, covers regiments and Abteilungen under the following groups:

Numbers in the series 1-70 are regiments, consisting usually of a regimental staff, Ersatzabteilung (replacement unit), and three combat battalions (I and II being mixed gun battalions and III a heavy searchlight battalion).

Numbers in the series 71-99 are in most cases independent light battalions. In some cases there are regimental staffs of the same number, without subordinate battalions.

The regiments in the series 1-70 and the light battalions in the series 71-99 formed the peacetime organization.

Numbers in the series from 100 upward are units formed on or after mobilization. In the case of heavy, mixed, light, or searchlight units, they may be regiments, regimental staffs, or independent battalions. Other types of antiaircraft artillery units, numbered in parallel series, include transport, railway, and balloon barrage units.

(2) Organization of Higher Units

Higher units have no fixed organization. They consist of staffs which command a number of subordinate units varying according to tactical requirements.

(a) Corps

The corps staff, which is motorized, operates entirely in the field. It originally commanded a number of brigades, usually two or three. It now normally commands two to four divisions, with subordinate regiments.

(b) Division

The divisional staff has been established since the outbreak of the war.

There are two types, static and motorized. The former commands one or more brigades in static defense, the latter a number of regiments, usually two to four, in field operations.

(c) Brigade*

The brigade staff commands a number of regiments, usually two to four. It is now confined mainly to fixed defense.

(d) Regiment

The regimental staff normally commands four to six battalions in fixed defense positions, or, in the field, an average of four battalions. Parent regimental staffs seldom actually command any of their own battalions. The battalions are usually allotted to combat units or to defense areas.

Note: Searchlight divisions, brigades, and regiments are also known, but little information is available as to their composition or method of allotment.

(3) Organization of Lower Units

(a) Abteilung (battalion)

Heavy--four heavy batteries
Mixed--three heavy and two light batteries
Light --three or four light batteries**
Searchlight--three or four (heavy) searchlight batteries.**

(b) Battery

Heavy--equipped with four or six heavy guns (usually 88-mm (3.46-in)) and two light guns (20-mm (.79-in)) for close protection.

Light-- usually equipped with twelve to sixteen 20-mm (or nine to twelve 37-mm (1.45-in)) guns. (It may be that only twelve 20-mm or nine 37-mm guns are the usual or normal equipment).

Searchlight--usually equipped with nine or twelve 1,500-mm (59-in) searchlights and an appropriate number of sound locators. (It may be that only nine searchlights are the usual or normal equipment)

Note: Light searchlights (600-mm (23.6-in)) are provided for co-operation with light guns and are normally allotted on the scale of one per platoon.

*One American Army authority doubts the existence of the AA Brigade. The British source of this article is quite definite as to its existence.
**There is evidence indicating that normally there are only three batteries in the light and searchlight battalions.

(c) Platoon

This is the smallest operational unit; it consists of either two heavy or three light guns.

c. Strength

The identifications made up to the outbreak of war show that the Germans were organizing for an establishment of 100 regular units (70 regiments and 30 independent battalions). In addition there were two independent regimental staffs (101 and 102) and Regiment General Göring (103) which was developed from Göring's personal boydguard, and eventually came to be regarded as the "crack" antiaircraft artillery regiment. There was also a training regiment (Lehrregiment), offshoots of which have since been employed in an operational capacity.

Since the outbreak of war the need for protecting Germany and, subsequently, the occupied territories from the growing strength of the United Nations power, together with the necessity of providing for active theaters of war, has resulted in an enormous expansion in the antiaircraft artillery organization.

Although the highest numbered unit identified is 999, this does not presuppose the existence of 999 units. Units are formed in series, possibly on a regional basis, and many series are undoubtedly either completely or partially unused. Up to the present some 550 Abteilungen have been identified, apart from miscellaneous units. The total antiaircraft artillery strength, including staffs and administrative personnel, is believed to be well over 1,000,000, and equipment employed to be in the neighborhood of 9,000 heavy guns, 30,000 light guns, and 15,000 heavy searchlights. A proportion of the equipment used in Germany and in some of the occupied countries is manned by Heimatflak ("Home Guard" antiaircraft artillery), a new branch believed to have been introduced early in 1942 (see Tactical and Technical Trends, No. 20, p. 4).

d. Employment for Home Defense

Antiaircraft artillery employed for fixed defense in Germany and occupied territories is administered and supplied through the Luftgau (Air Force Administrative Area), subdivision of the Luftflottenkommando (Air Corps Area).

Originally, the Luftgau was also an operational command, exercising its function through antiaircraft artillery regimental staffs, of the antiaircraft artillery units in its area. Since the introduction, some time after the French Campaign, of antiaircraft artillery divisions and brigades employed for static defense, it is believed that the Air Corps Area has exercised its operational control through these units instead of through the Air Force Administrative Area, though in relatively unimportant areas the old system has probably remained in force. An Air Force Administrative Area is divided into Flakgruppen (antiaircraft artillery groups), commanded by regimental staffs, and Flakuntergruppen (sub-groups), commanded by Abteilung staffs. Gun and searchlight sub-groups are allocated for the defense of ports, towns, factories, etc. according to their importance.

e. Gun Layouts

Heavy guns are usually sited in fours (in the form of a square), or in sixes. The command post, comprising director, heightfinder, and radar equipment, is located to one side, and there is often an additional or alternative subsidiary instrument pit for emergency fire-control equipment in the center of the gun layout.

Light guns are usually sited in threes, though sometimes singly.

f. Methods of Fire Control

(1) Heavy Antiaircraft Artillery

Whenever possible, heavy gun positions engage visually, either by day, or with searchlight cooperation by night. The next most popular method of engagement is "deterrent fire," which involves firing at the visual or imaginary intersection of searchlight "cones" and for which broken cloud conditions are the most appropriate. "Unseen" fire (fire at invisible targets) with the aid of radar data is frequently employed both by night and in cloudy weather by day; less common methods of "unseen" fire control are instrument-directed concentrations or salvoes. Barrage fire, which may be in almost any shape (box, cylindrical, layer, etc.), is occasionally resorted to against particularly heavy and concentrated attacks. Barrage fire is used mostly at night or under conditions of bad visibility; the development of modern instruments has made its use secondary.

(2) Light Antiaircraft Artillery

By day or by night, light guns engage visible targets by means of their antiaircraft artillery sights (Flakvisiere) or by observation of tracer. By night, they often fire up the searchlight beams or at the apex of searchlight "cones" in the hope that an aircraft is in or near the beam*. Barrage fire, which has a purely deterrent value, is infrequently employed.

g. Searchlights

Great reliance is placed on searchlights, which are deployed in very large numbers in gun-defended areas. Spacing of lights varies considerably, but averages about 1,500 yards in heavily protected areas. Control is maintained in general by means of sound locators, with which a high degree of efficiency has been achieved. A certain measure of radar control is being introduced, but this is not believed at present to be very widespread.

In addition to searchlights in gun-defended areas, a large number of searchlights used to be deployed in belts to assist in night-fighter interception. This policy has recently been modified, possibly as a result of improved methods

*In view of the limited range of these light weapons it is probable that this is done only in conjunction with light (600-mm) searchlights or against low-flying aircraft.

of radar interception; the main belts have been dissolved. Searchlight cooperation with night fighters is, however, still in evidence in some areas.

h. Balloons

Balloon barrages are found at many of the most important target areas in Germany and occupied territories, as well as around relatively isolated, vulnerable points, such as a single factory. The average heights at which they are flown is about 6,000 to 8,000 feet, although reports of balloons operating at 11,000 to 12,000 feet are occasionally received. Operation at higher levels, however, involves weaker cables and consequently a reduction in defensive value. A new balloon, smaller than the normal type, is believed to have been introduced recently. It is designed specially as a counter to low-level attack and probably cannot be flown higher than about 4,500 feet.

i. Employment with the Field Army

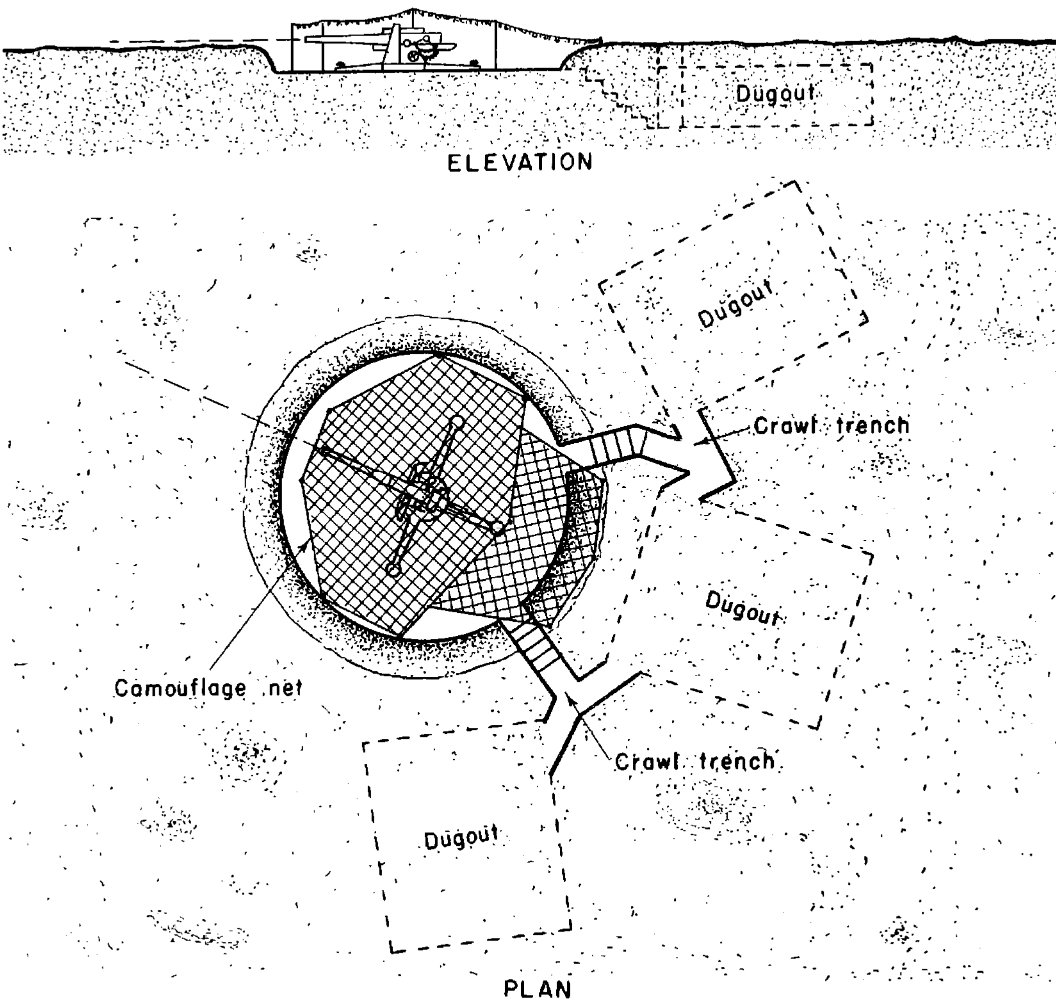
In the field, antiaircraft artillery is operationally subordinate to the commander of the army to which it is attached, while remaining subordinate to the German Air Force for administration. Its use in cooperation with the army is extremely flexible, the scale and method of employment being varied, frequently at very short notice, according to the tactical situation. In general an antiaircraft artillery corps works with an Army Group, the chain of command being exercised through antiaircraft artillery divisional and regimental staffs down to the battalions. Although no hard-and-fast rule can be laid down, an antiaircraft artillery division generally works with an army, and a regiment with an army corps; individual battalions are allotted to army divisions, preference usually being given to armored and motorized units. All antiaircraft guns, up to and including the 88-mm, are dual-purpose and, when attached to the field army, units carry AP and percussion as well as time-fuze ammunition. In all campaigns of the present war, antiaircraft artillery units have been found in the forefront of the battle, where the heavy guns in particular have been used more and more in a ground role, successfully engaging Allied armored units, artillery positions, and fortifications.

j. Primary Role

In spite of the increasing use of antiaircraft artillery with the field army, its chief function remains that of defending Germany and occupied territories from air attack, and it is lavishly employed for this purpose. However, to ease the strain on manpower imposed by Germany's war effort, large numbers of trained antiaircraft personnel have been transferred to ground combat units to serve as infantrymen, field artillerymen, etc. This transfer has been made possible without appreciably weakening the antiaircraft defenses of Germany and occupied territories by the use of railway antiaircraft artillery, which can be transferred rapidly from place to place for the temporary reinforcement of threatened areas, and by the introduction of Heimatflak (home defense units) involving the partial replacement of regular antiaircraft artillery personnel by factory and office workers and more recently by 16- and 17-year-old boys.

4. A GERMAN ANTITANK GUN EMPLACEMENT

A sketch of a German diagram of an emplacement for an antitank gun shows some interesting details. The diagram is stated to have been prepared for a defense system based on defense areas. The German document in explanation thereof follows.



ANTITANK GUN EMPLACEMENT

"The positions will be arranged in accordance with the following plan:

(a) Field of fire in all directions;
(b) The crew as near as possible to the gun;
(c) Two to three men in one dugout with the dugouts mutually interconnected;

(d) Crawl trenches to the position. This will allow firing in any direction; enable the crew to be ready for action at all times; and permit the men to move about unobserved even during the day."

5. GERMAN 88'S IN TUNISIA

A battalion commander of a U.S. tank regiment which saw a lot of action in Tunisia is the source of the following observations on the tactical use of German 88-mm AA/AT guns against tanks and other vehicles.

* * *

German antitank gunnery has made our reconnaissance a particularly tough job. They drag their big 88-mm guns (maybe 75's as well--I know they bring 88's) up behind their tanks and drop them in position. Usually the crew digs the gun in a hole 12 by 12 by 6 feet deep, practically covering up the shield and exposing only the barrel of the gun. They are the most wonderful things to camouflage I have ever seen. They are very low to the ground. You can watch the fire coming in; little dust balls on the ground give them away and show how low they are. The gun looks like a pencil or black spot. The shield is level with the piece and all you can effectively see is the tube. Apparently they use mats to hide the muzzle blast. When the Germans go into position they'll hide their guns and tanks in anything, including Arab huts. They dress their personnel in Arab garb while going to and from their positions. We've found these guns particularly hard to locate, and they can break up your entire show if you don't pick them up in time. Once we hunted a gun within a thousand yards for 3 days, and then only found it by spotting the personnel approaching the gun position.

Generally the Germans try to suck you into an antitank gun trap. Their light tanks will bait you in by playing around just outside effective range. When you start after them, they turn tail and draw you in within range of their 88's. First they open up on you with their guns in depth. Then when you try to flank them you find yourself under fire of carefully concealed guns at a shorter range. Don't always bite at the first 88's which shoot at you. There will be several up much closer. The first 88 that barks and the first tank are generally bait. If they stage a night attack or late evening attack, and neither side stays on the battlefield, they will come out and put their 88's in no-man's-land away ahead of their tank positions. In one instance their tanks were within 1,000 yards of a pass, but their guns were 4,000 yards on the other side. Usually the Germans will try to suck you inside of a 1,200-yard range. Over 1,200 yards there is no use in worrying about their antitank fire because it will bounce off the medium tank at that range. Under 1,200 yards, watch out. Their gunnery stinks at long ranges. I feel that our men are better. The Germans frequently use machine guns to range themselves in, and you can duck their shells by watching that machine-gun fire. When they're moving they'll shoot at anything that looks suspicious and they'll generally knock

down every Arab house in sight. Sometimes they'll get the range with high-burst smoke shells; three of these in a line is the high sign for the Stukas.

ARMORED FORCE

6. GERMAN RULES FOR TANK EMPLOYMENT

A translated German document issued in the form of a general order by the Panzer Army High Command lists the following 10 rules on the function and employment of tanks.

* * *

Panzer Army High Command 5 HQ. 10 March 1943

COMMANDER-IN-CHIEF

GENERAL ORDER NO. 14

Ten Rules of Tank Employment

1. The tank is a deciding weapon in battle. Therefore, employment should be limited to the "main effort" in suitable terrain.

2. The tank is not an individual fighting weapon. The smallest unit is the tank platoon; for larger missions, the tank company.

3. The tank is not an infantry support weapon. It breaks into and through the enemy line, for the closely following infantry.

4. The tank can take a piece of terrain and clear it, but it cannot hold it. This is an infantry mission, supported by infantry heavy weapons, antitank guns, and artillery.

5. The tank is not to be employed as artillery, which fights the enemy for an extended period from one position. The tank fights while moving with short halts for firing.

6. The mission of the infantry is to pin down enemy defensive weapons, and to follow the tank attack closely in order to exploit completely the force and morale effect of that attack.

7. The mission of the artillery is to support the tank attack by fire, to destroy enemy artillery, and to follow closely the rapidly advancing tank attack. The main

task of the artillery support is continuous flank protection.

8. The mission of the tank destroyers is to follow the tank attack closely and to get into the battle immediately when tank fights tank.

9. The mission of the combat engineers is to clear minefields and to open gaps under tank, infantry, and artillery protection, in order to enable the continuation of the tank attack.

10. The tank is blind and deaf at night. It is then the mission of the infantry to protect the tanks.

7. GERMAN TANK RUSE

In commenting on German tank tactics, a junior officer of a U.S. tank unit which fought throughout the North African campaign observed that, "when you fire on the German tanks, they play a bag of tricks. First they stop, causing you to think you knocked them out. When you turn around on something else--wham, they open up on you."

ARTILLERY

8. NOTES ON GERMAN ARTILLERY FORWARD OBSERVERS

In the observation of fire, the greatest reliance by the Germans is placed on forward observers. Often the battery commander himself goes ahead in this role. The part that the observer plays in German field operations is brought out in the following translation from a recent issue of Artilleristische Rundschau.

* * *

The artillery forward observer (Vorgeschobene Beobachter) plays a decisive part in the success of infantry. In the attack he goes along with the infantry, accompanied by a radio operator. If the attack is stopped, this observer calls for fire on enemy points of resistance and carries the infantry on to the next assault. In static warfare, the observer orders destructive fire against the enemy and covering fire to aid his own troops. He also directs destructive fire against enemy infantry who are about to attack or actually attacking. The results of this are shown not only in the effective cooperation between the two arms, but in the existence of a spirit of brotherhood in combat--the artillery forward observer becomes the best friend of the infantry.

A few examples from the Eastern Front will illustrate the role of the forward observer.

In one instance, a German battalion was attacking a Russian objective at a place where there was a churchyard in close proximity to the Russian rear; the attack was gaining ground very slowly, impeded by stubborn defense and by poor observation for the German artillery. Finally, a forward observer succeeded in the face of Russian fire in reaching an observation position located at the flank, whence he could observe the churchyard. The signal troops, working fast, established communication in a very short time with the battery, which was then able to deliver well-placed fire. The opponent was so pinned down that the attack regained its impetus. In a short time the village and churchyard were captured.

In August 1941, a German division had been defending for some time a stream south of C--. A battalion received the mission to make a limited-objective attack in order to secure prisoners; the attack was to be made with a reinforced company, supported by heavy infantry weapons and artillery. After assembly in combat outposts, the company began the attack in several groups. The forward observer of a light battery and heavy battery went forward with the company, while at the same time another forward observer was stationed in the advance combat positions of the sector to the right of the attack in order to watch for any threat to the flank. Given excellent support by the artillery, and working skillfully through the terrain, the assault troops succeeded in penetrating deeply into the Soviet positions, without loss, and in capturing prisoners and weapons. At the same time, on his own initiative, the company commander in the sector to the right sent a weaker assault group to capture a Russian scout squad. The forward artillery observer in this sector supported the effort so well that nearly all the personnel of the scout unit were disabled or captured. The result of these two operations was a total of 42 prisoners and 12 captured machine guns and mortars, while on the German side the only casualty was one soldier slightly wounded. The skillful and rapid fire-support given by the artillery as a result of the work of the forward observer played a major role in this success.

A forward observer showed up well in another local assault by a neighboring regiment. The night before the operation, he went into no-mans-land with a scout squad. Three kilometers in front of the German lines he found a hide-out, and for 9 hours observed the Russian position from so short a distance that no detail could be missed. He could look into each pit dug for protection against tanks and could almost count the number of occupants in each. The next morning the assault group attacked at the appointed time. The radio of the forward observer had scarcely given the first order of command when the answers roared from 3 batteries. The Russian position was thoroughly raked. After a momentary pause, a powerful concentration of fire was placed on the left-hand sector of the enemy positions, only to move in another instant 100 yards to the right on a zigzag trench net. On the left, where the dust clouds from the bursts were slowly settling, the hand grenades of the assault troops were already exploding. With incredible speed, the trenches were mopped up, and always, throughout the action, the concentrated fire of 12 guns moved just before the assault group from right to left. About 500 meters of the Russian position was overrun in this way. With the mission accom-

plished, the assault group withdrew from the Russian positions, while the forward artillery observer placed his fire to cover the withdrawal. Numerous prisoners and weapons were brought in, without any losses suffered by the Germans. In this case too, the service of the forward artillery observer was no minor factor.

Every member of the First Battalion still remembers the day at 0-- in September 1941. This position was taken by storm without any difficulty. However, before the battalion had organized itself for defense, the Russians made a counter-attack in heavy force, supported by 18 tanks and designed to recover the locality. Fortunately, the second battery which had been attached to the battalion had moved its position and was ready for action, having established communications with the forward observer. Gun after gun fired its destructive barrage into the massed ranks of the Russian infantry following the tanks. Even the tanks hesitated, and then gave up the attack. The Russian attack was repeated several times in very strong force, and every time was stopped by the barrage ordered and directed by the forward observer. Bodies of Russians and ruined tanks covered the field at evening, and the battalion officers thanked the battery commander, assuring him that the village would have fallen had it not been for the artillery support and the courageous conduct of the forward observer, who had fallen in the combat.

ENGINEERS

9. GERMAN TELLERMINES

Land mines are not a new development, but their use in astronomical numbers, as in recent campaigns, is new to this war. The mine is normally associated with war at sea. But the pre-eminence of the tank, or "land battleship," in battles on land has emphasized the importance of the land mine and made its use mandatory around any well-defended position. Among the most widely used anti-tank mines is the German Tellermine. The four known models of this mine are described below.

a. Tellermine No. 1

The 1935 model or Tellermine No. 1 is circular in plan with a diameter of 12 3/4 inches. It has a convex top, a flat bottom, and a maximum height of 3 1/4 inches. The total weight of the mine is 19 1/4 pounds. In a fully armed condition the mine is equipped with a main pressure igniter in the center of the top cover, and one or two standard pull igniters in its base as secondary firing devices. The principal features of this mine are shown in the accompanying sketches (fighre 1). The body of the mine is a circular metal box (1) with a dome-shaped top surface containing 11 pounds of high-grade pressed TNT. A "floating" cover (2) is held down by a heavy metal ring (3) attached to the body and is supported in the center by a heavy spring (4). The spring fits into and bears on a metal fitting (5) which fits into the top of the body. The fitting also acts as a receiver for the detonator (6). Directly above the detonator are the two metal

collars (7) and (8) (which screw into a recess in the fitting), a compressible rubber ring (9), and the igniter (10). The lower collar (7) is a retaining collar for the detonator; the upper collar (8) is an adjusting or positioning collar for the igniter. The compressible rubber ring serves as a cushioned seat for the bottom of the igniter. The upper collar is screwed into the proper position in the

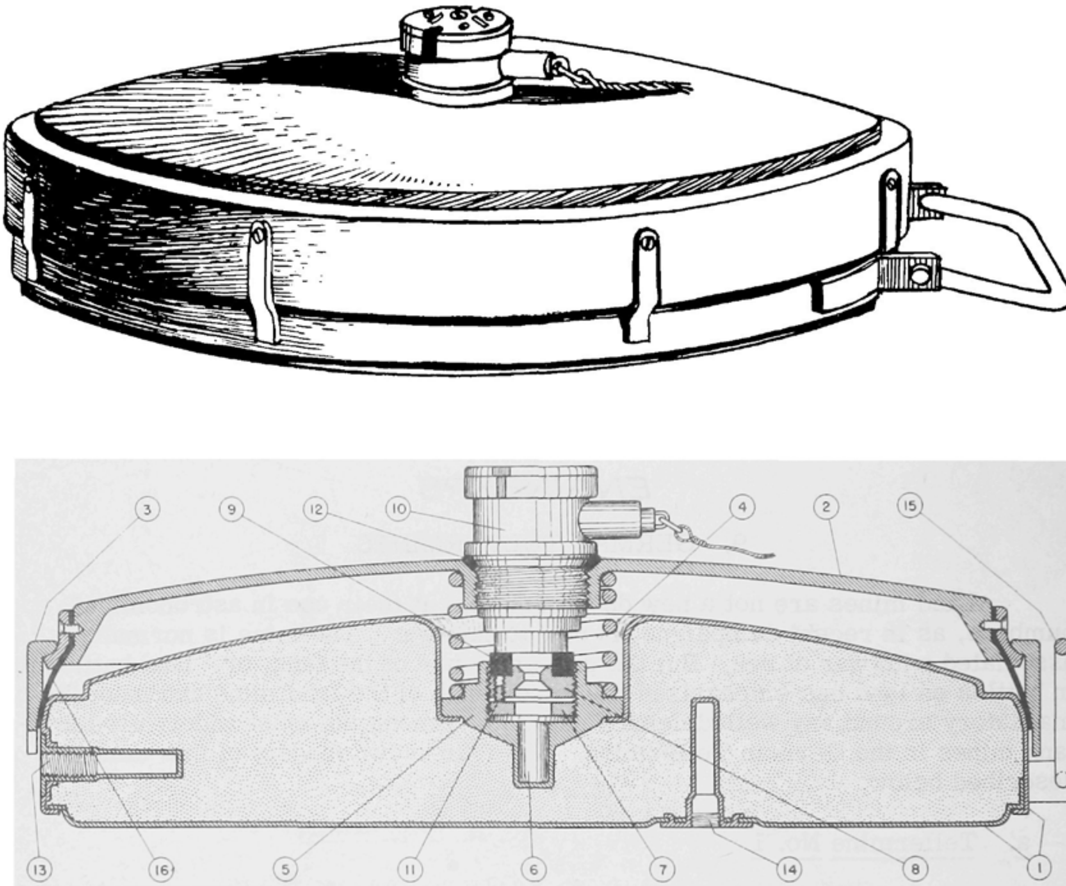


FIG. 1

fitting by means of a special tool. The small, headless set-screw (11) holds the collar (8) in position. The igniter is screwed into the mine cover (2) until it bears firmly on the rubber washer (12) and the rubber ring (9). The body of the mine has two receptacles (13) and (14), threaded to receive secondary firing devices. One receptacle is usually located in the side of the body opposite the handle, and the other in the bottom between the handle and the center of the mine. The mine has a metal carrying handle (15). A rubber strip (16) seals the junction between the cover and the body of the mine against the entry of water and dirt. The washer (12) seals the joint between the igniter and the cover.

b. Tellermine No. 2

This mine, thought to be the 1942 model, is similar in size to the 1935 model or Tellermine No. 1. Its main dimensions are:

Maximum diameter (at base)------------	12.75 in
Maximum height-----------------------	4.1 in
Diameter of pressure plate -------------	5.7 in
Total weight of mine (filled) ------------	19.3 lb
Weight of filling (TNT plus three penthrite detonating charges)-------------	12.0 lb

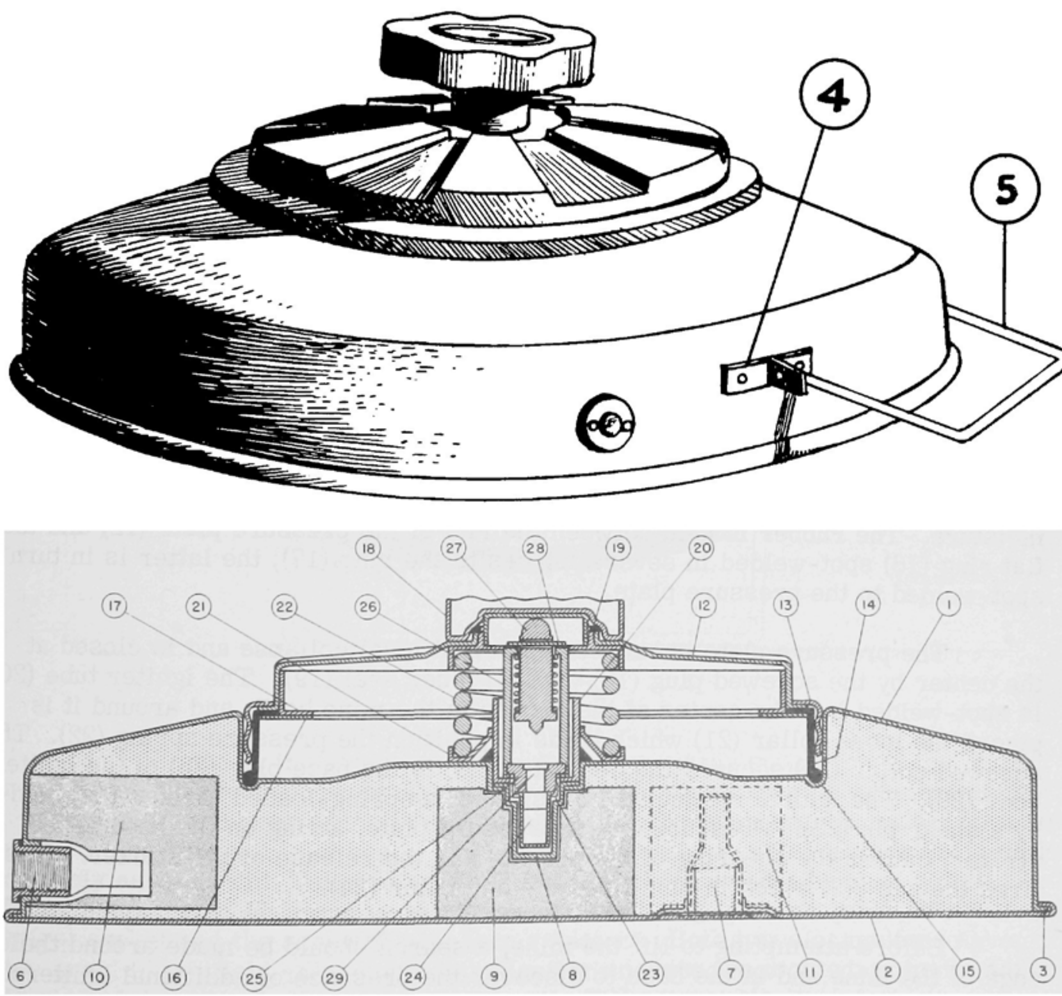


FIG. 2

The mine consists of a body (1) (see figure 2) fitted to a circular base plate (2). The base plate is turned over along its edge to make a press fit over the flange of the body as indicated at (3). A carrying handle (5) is attached by

means of a T-strip (4) which is welded to the body.

The mine is fitted to take two additional igniters. One is located in the side of the mine 4 inches from the handle at (6), and the other is in the base of the mine at (7). The pocket or receptacle (8) for the main detonator protrudes into the mine filling, and is surrounded by a cylindrical penthrite detonating charge (9). Cylindrical penthrite detonating charges (10) and (11) also surround the screwed-in pockets for the additional igniters. The details of these detonating charges are as follows:

Detonating Charge at	Length	Diameter	Weight
(9)	1.6 in	2.38 in	0.36 lbs
(10)	2.3 in	1.6 in	0.25 lbs
(11)	1.6 in	1.6 in	0.11 lbs

The pocket or receptacle for the base igniter (7) is fastened to the circular base plate (2), its center being 2 1/4 inches from the center of the base plate. The base plate is pressed on and crimped to the circular body (1) without regard to maintaining a fixed position for the base igniter relative to the main igniter-detonator assembly. As a result, the base igniter may lie with its center at any point on the perimeter of a circle with a radius of 2 1/4 inches from the center of the base plate (i.e., also from the center of the main igniter-detonator assembly). This should always be borne in mind in searching for the position of the base igniter. The pressure plate (12) is held in the body by means of the collar (13), which is a spring fitted into the recess. The pressure plate has a rubber skirt (14) which fits into the depression (15), so that when assembled the operating mechanism under the pressure plate is protected from the entrance of dust and moisture. The rubber is held between the rim of the pressure plate (12) and the flat ring (16) spot-welded in several places to the ring (17); the latter is in turn spot-welded to the pressure plate.

The pressure plate is shaped to prevent local collapse and is closed at the center by the screwed plug (18) with a rubber seal (19). The igniter tube (20) is spot-welded into the center of the recess in the mine body, and around it is placed the loose collar (21) which holds in position the pressure spring (22). The screwed collar (23) secures the detonator (24) to the base plug (25) of the igniter body (26). The igniter mechanism consists of a spring-loaded striker (27) held by a shear pin (28). Pressure on the pressure plate, acting on the head of the striker, causes the shearing of the pin (28) and the release of the striker. This fires the cap (29) which in turn fires the detonator (24).

Before attempting to lift the mine, a search should be made around the edge of the mine and in the base to discover the presence of additional igniters. If any are found they should be neutralized and the attached wires cut. The screwed plug (18), when unscrewed, can be removed, thus revealing the igniter below. When the igniter is lifted out, the mine is disarmed since the detonator is attached to the igniter. The additional igniters should then be unscrewed, and the detonators below them removed.

c. Tellermine No. 3

A third type of German Tellermine has been reported (see figure 3). This mine is 12 1/2 inches in diameter, with a maximum height of 3 3/8 inches. It has a total weight of 21 pounds and is painted a mat gray. It has the following markings:

On the top, in white paint-------------	T. Mi S31 Tvii. 2.42
On the top, in black paint-------------	S 88 12 42A.
Stamped on the top------ ------------	WO 42

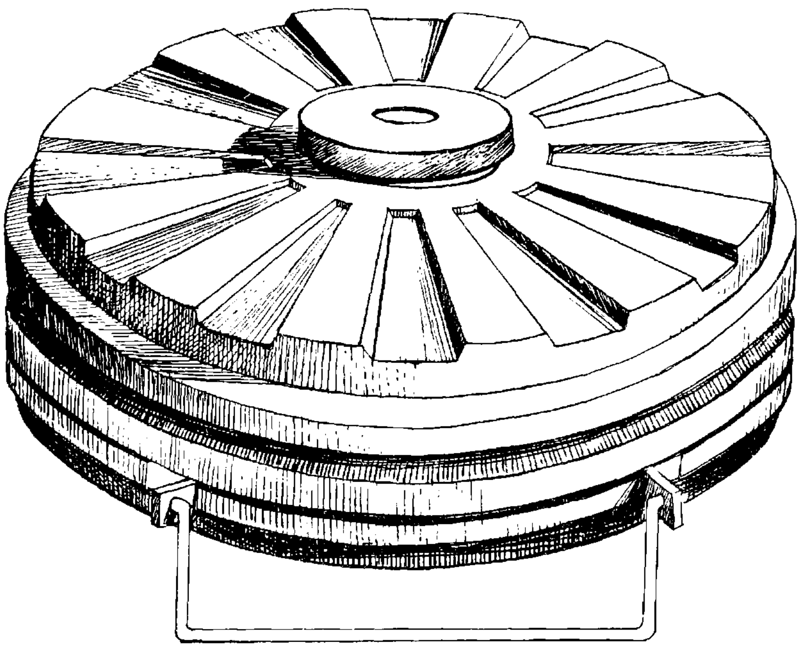


FIG. 3

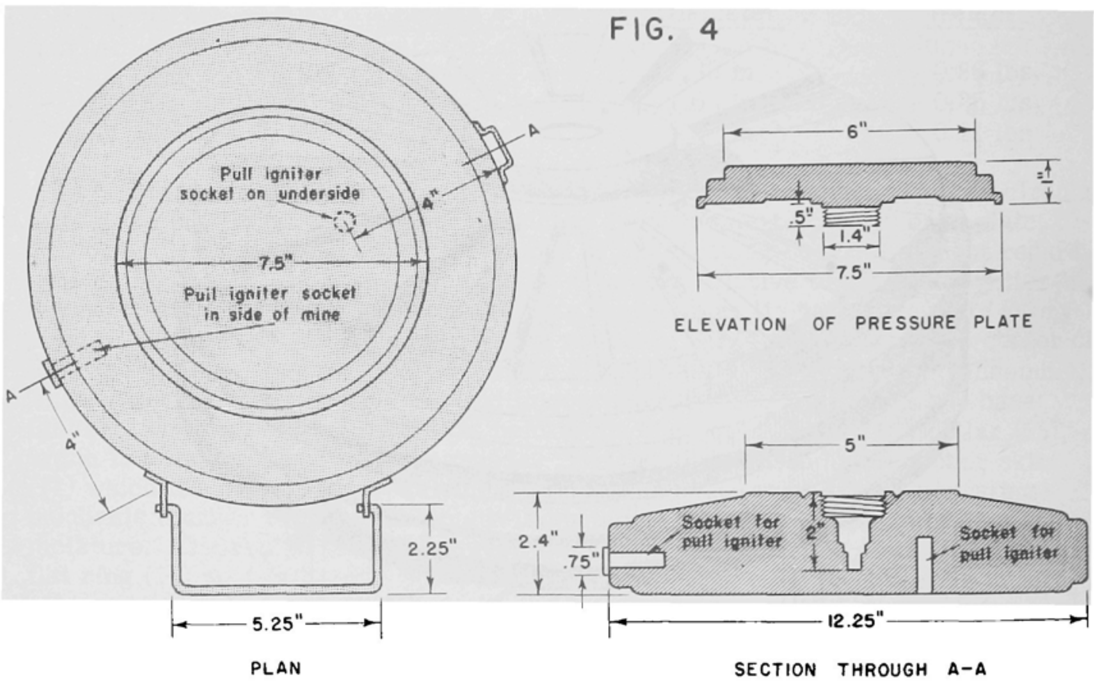
In this model, the pressure plate extends over the entire top of the mine, and is fluted or grooved, probably to prevent sand being blown off when the mine is buried. In the center of the pressure plate is a threaded socket, closed by a screwed plug with a milled head. This socket will take the standard brass igniter assembly as used with Tellermine No. 1 but the mine can also be used with igniter assembly of Tellermine No. 2, the igniter being inserted through the central socket and the screwed plug then replaced. Both types of igniters have been found in the field. The subsidiary igniter sockets are located on the bottom and side of the mine in the same places as in Tellermine No. 1.

d. Tellermine No. 4

The details of a fourth type of German Tellermine have recently become available. Tellermine No. 4 is circular in plan (see figure 4) with a diameter of 12.25 inches and over-all height of 3.4 inches. The base is flat and the cover slightly dome-shaped. The total weight of the mine is approximately 18 pounds. The mine is painted field gray, and the pressure plate black. Stencilled on the top of the mine in white is:

"T. -Mi. - Pilz 43/T. -Mi. -Z42 13A"

FIG. 4



There are two screwed holes for additional igniters, one in the side of the mine 4 inches from the carrying handle, and the other in the base, offset from the center--as in Tellermine No. 2. It has been reported that this mine has also been found with the holes for additional igniters located in the side of the mine opposite the handle and in the base between the handle and the center--as in Tellermines Nos. 1 and 3.

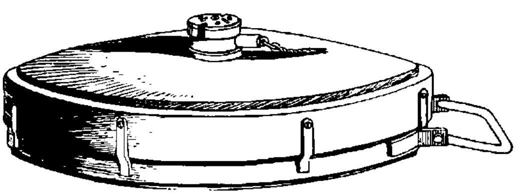
The pressure plate is a flat metal plate 7 1/2 inches in diameter, which screws complete into the central socket over the normal Tellermine No. 2 igniter. Neither the pressure plate nor the body of the mine is fluted.

The mine functions when pressure on the pressure plate causes the latter to descend and shear the igniter shear pin, thus releasing the springloaded striker.

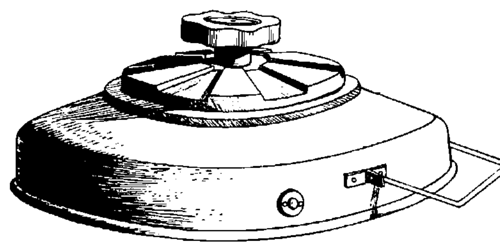
To neutralize this mine the sides and bottom of the mine should first be examined. If additional igniters are found, they should be neutralized. The pressure plate should then be unscrewed and the igniter removed.

e. Comparison

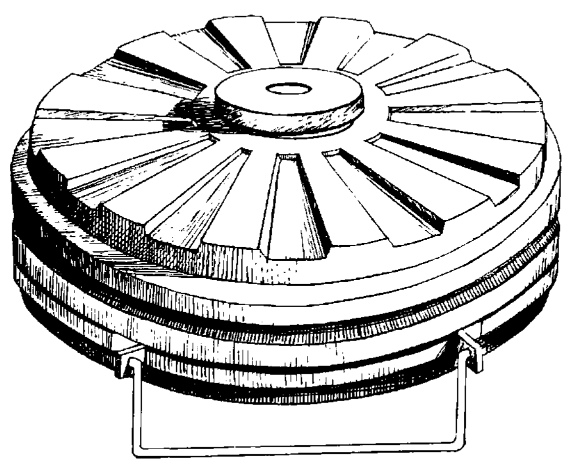
The pressure plates on Tellermines No. 1 and No. 3 extend over the entire top of the mines, but the pressure plates on Tellermines No. 2 and No. 4 cover only the center portion of the mine. Accordingly a tank might pass over the edge or rim of Tellermines No. 2 and No. 4 without detonating the mines, whereas the same load passing over the edge or rim of Tellermines No. 1 and No. 3 would



Tellermine No. 1



Tellermine No. 2



Tellermine No. 3

detonate the mine. It is possible for a spread-out load of fairly low intensity covering the whole top of Tellermines No. 1 and No. 3 to detonate them, while a more heavy, concentrated load is necessary to detonate Tellermines No. 2 and No. 4.

The pressure plates on Tellermines No. 2 and No. 3 are fluted or grooved, but the pressure plates on Tellermines No. 1 and No. 4 are smooth.

In Tellermine No. 4, by adopting a simpler form of pressure plate and utilizing the simple igniter found in Tellermines No. 2 and No. 3, the considerable production difficulties, which were entailed in the manufacture of Tellermine No. 1, particularly its T. Mi. Z35 igniter, have nowbeen largely overcome.

10. ELECTRIC IGNITER FOR GERMAN S-MINES

The existence of a new electric igniter has been reported from North Africa. The name of this igniter is the E.S. MiZ 40 (elektrische S-Minenzunder 40). It is designed for use with the German antipersonnel bounding mine ("Silent Soldier") also known as the "S" Mine (Schutzmine--protective mine). It consists of two "chains" of nine initiating igniters apiece, connected in parallel to a firing bridge attached to the mine. Each initiating igniter is a pressure igniter which uses a chemical action to heat a resistance wire in the firing bridge.

a. Description

(1) Initiating Igniter (Figure 1)

Each igniter consists of an ebonite body (1) which encloses a mechanical firing assembly, and an ebonite spike (2). The firing assembly is a ball release device and consists of a two-part housing (3) screwed into the body (1), a plunger tube (4), and a striker (5). The plunger tube (4) is held up by a spring (6), and the striker (5) is held in the cocked position by a compression spring (7) and two balls (8) engaging a groove in the head of the striker (5). An ampoule (9) takes the place of a percussion cap and is held in a recess formed in a porcelain fitting (10) which is fastened by studs to the body (1). The ampoule (9) contains an orange-colored liquid, which, when the ampoule is broken, forms an electrolyte creating a small cell, of which the electrodes (11) and (12) are provided by the lining of the recess in the fitting (10). Electrode (11) is connected to the positive terminal (13), and electrode (12) to the negative terminal (14). To the terminals (13) and (14) are connected two electrical leads (15) and (16) which are held to the igniter by means of the studs (17). A three-pronged pressure head (18) with a sleeve fit is pressed into the top of the plunger tube (4). In the unarmed condition, a safety rod (19) is fitted through the top of the plunger tube (4) and positioned by a spring-actuated ball catch. The ring of the safety rod is folded over the plunger tube (4), and an ebonite safety transit cap or plug (20) is screwed onto the plunger tube (4). When the igniter is located in very soft earth, a circular plate (21) (see figure 2) is provided through which the spike (2) is driven.

(2) Firing Bridge (Figure 2)

The device consists of a bridge (22) with a resistance wire housed in an aluminum tube (23) which is protected in transit by a cap (24). The bridge (22) is provided with terminal sockets (25) into which plugs (26) are inserted. One socket is colored red and receives the red-colored plug, and the other socket is colored black and receives the black-colored plug. The plugs (26) are pro-

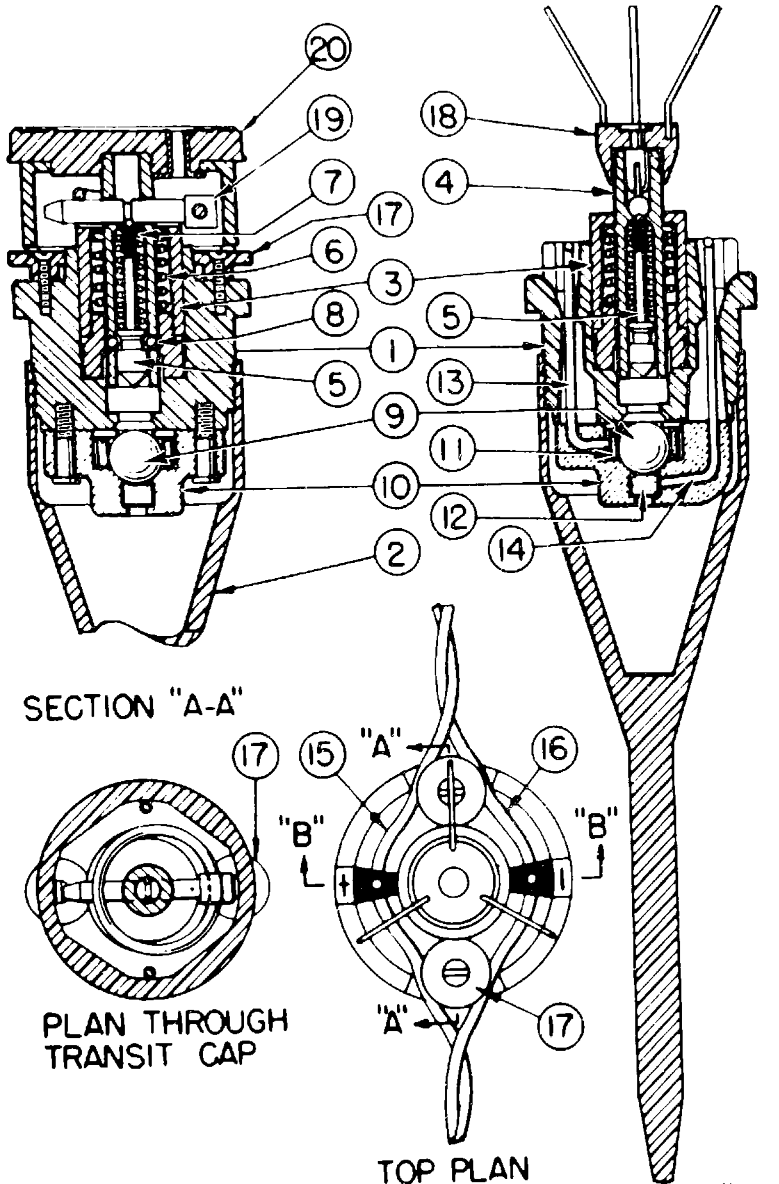


FIG. 1

IGNITER E.S. Mi. Z. 40 (ELECTRICAL)
INITIATING IGNITER

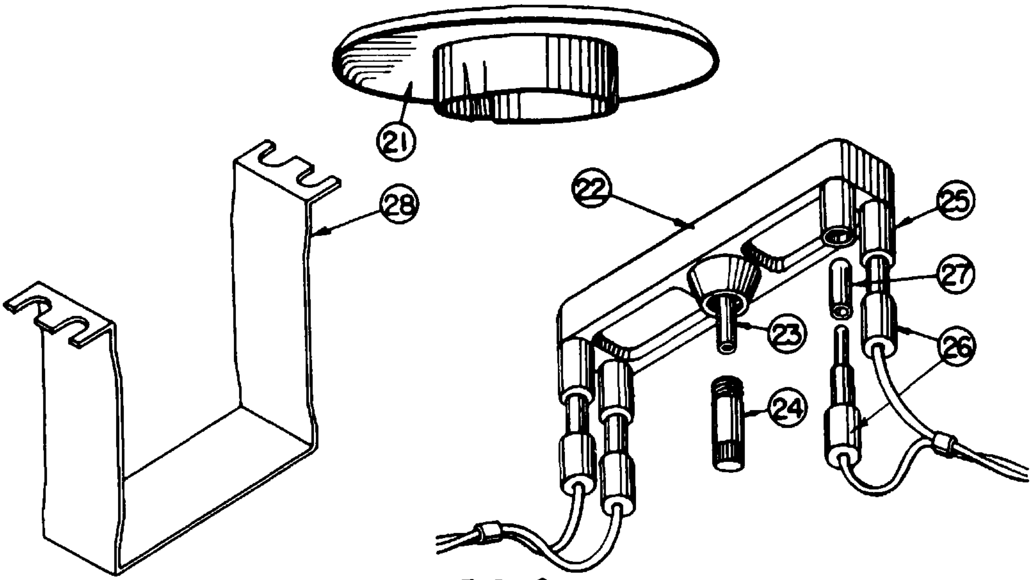


FIG. 2
IGNITER E.S. Mi. Z. 40 (ELECTRICAL) FIRING BRIDGE

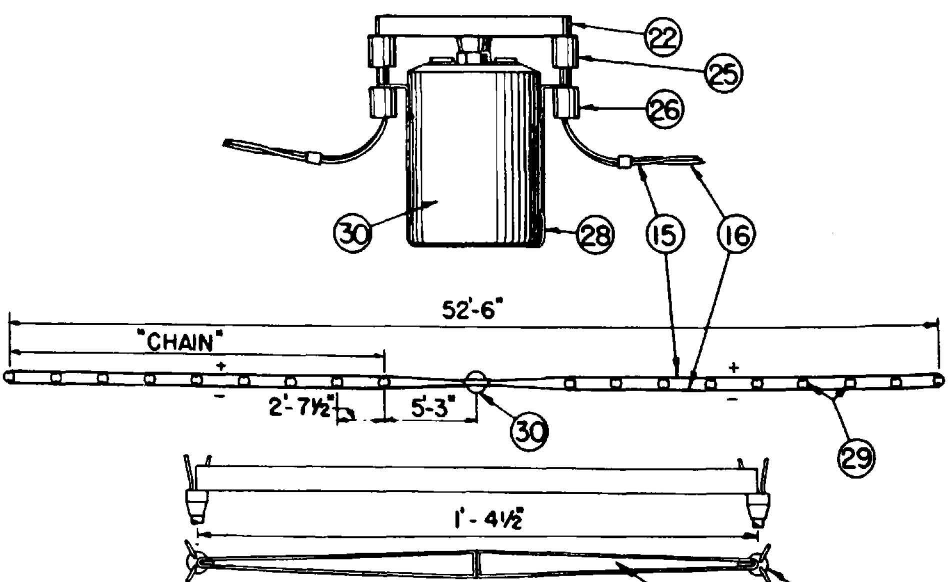


FIG. 3
LAYING IGNITER E.S. Mi. Z. 40 (ELECTRICAL)

tected in transit by caps (27). The bridge (22) is screwed onto the detonator tube of the antipersonnel bounding mine, which is then set into a "U"-shaped clamp (28) which also grips the plugs (26).

b. Employment and Installation

This igniter is used with the standard German antipersonnel bounding mine (Silent Soldier) in the following manner: two chains of nine igniters each (29), see figure 3, are wired up in parallel with 2 ft. 7 1/2 in. of wire between each igniter and 5 ft. 3 in. of wire between the end igniter in each chain and the plug (26) attached to the mine (30). Two furrows are made in the ground on either side of the mine (30) to receive the electrical leads (15) and (16). The igniters (29) are then driven into the ground until the top of the safety transit cap or plug (20) (see Fig.1) is level with the ground. If the ground is soft, use the circular plate (21) (see Fig.2) with the spike (2). Test the leads with a lead tester by plugging the plugs (26) into the tester and short-circuiting the most distant igniter. Unscrew the safety transit cap (20) and release the safety-pin rings from engagement with the plunger tubes and clip the withdrawal cords onto the rings. Screw the bridge (22) onto the mine and place the mine in the holder (28). Insert the plugs (26) in the sockets (25), red to red and black to black, and push them home. If required, a pressure bar (31), 1 ft. 4 1/2 in. long, can be placed on one prong each of adjacent igniters (29), which are also spaced at 1 ft. 4 1/2 in. so as to correspond with the length of the pressure bar (31).

c. Operation

When one of the initiating igniters (29) or the pressure bar (31) is stepped on, the plunger (4) is depressed until the balls (8) are released into a groove formed in the housing (3). The striker (5) is thus released and the compression spring (7) drives it onto the ampoule (9) which is broken. The liquid then creates an electric current which heats up the resistance wire in the tube (23) which fires the mine.

d. To Neutralize

When a "chain" of initiating igniters E.S.Mi.Z.40 is discovered, trace the electrical leads (15) and (16) to the mine and pull out all the plugs (26) from their sockets (25) in the bridge (22).

11. ENEMY BOOBY TRAP

Recently, some British engineers came upon a new type of booby trap during the clearing of a landing runway. When a bush was dug up after the area had been swept with mine detectors, an explosion occurred which led to the discovery that the enemy had deeply buried two German antipersonnel "S" mines which were probably connected to a trip wire carefully concealed in the lower branches of the bush.

INFANTRY

12. THE GERMAN SOLDIER IN DEFENSE

The following is a translation of an unsigned article which appeared in the semi-official German Army journal Militaer Wochenblatt. The fact that it appears in this normally authoritative and apparently widely read Army journal, and the critical tone in which it is written, show that the conclusions drawn are regarded in army circles as of some importance.

* * *

The attack, and only the attack, will make for victory. For this reason our Field Service Regulations rightly state that only offensive conclusion of defensive operations can bring off a decisive victory. But, on the other hand, in the course of any long war, no army is likely to escape defensive operations; no army is strong enough to be attacking everywhere and all the time. Moreover, there are times when it is better to allow the enemy to attack and only go over to the attack yourself when the enemy has thoroughly tied himself up. If the campaigns of 1939, 1940, and early 1941 found the German Army on the defensive only in a very few areas and only for a very short space of time, this was because of the extraordinarily fast tempo of events up to the complete conclusion of the fighting. The importance of defense and its significance in the education and training of troops is not diminished by these facts. In fact, no body of troops knows during its training what tasks it may be called upon to perform. During a war the tactical situations change so quickly, suddenly, and unpredictably that all troops must be educated and trained for defensive as well as for offensive action.

It was quite correct for our military education to lay the chief stress on the attack, as it still does. Moreover, in the past, there was very little time to teach defensive action. But this must not make us fail to recognize, with even more reason, that in concentrated wartime training some subjects are more neglected than others, and in our opinion this applies especially to defense. This article, therefore, will attempt to outline a few points, the teaching of which might well increase the defensive capabilities of the German infantryman, and, moreover, save lives.

The first essential is a sure and ready sense for ground. As is well known, the Higher Command lays down the main battle zone on the map, taking into consideration only major factors, e.g., the siting of artillery, observation posts, and antitank defense, while subordinate commanders subsequently reconnoiter the main defensive line on the ground, taking into consideration, above all, the siting of the infantry support weapons. If junior commanders have time for ground reconnaissance, they will normally find the right position. But if defense is taken up hastily, as is very often the case, then there is a noticeable lack of good judgment. Officers and men, in our opinion, have much too great a tendency to stick to the ground they have first settled on. Judgment of ground in the long run only means, in essentials, getting all the advantages for yourself and giving the enemy all the difficult ground. Naturally, that's easier said than done. But even if, as is usually the case, unfavorable ground has also to be occupied, it is important to recognize this fact and to take the proper tactical measures to make up for it, e.g.,

siting reserves behind the probable danger area, thickening up antitank defense where the danger from tanks is greatest, etc. Training of this kind can only be carried out on the ground, both with troops and without, by means of a series of very small-scale exercises calling for ground evaluation. In these exercises all units down to the very smallest must be considered in detail. Any high-and-mighty treatment of this subject is out of place. There seems to be by no means the universal recognition that there ought to be, for example, that edges of woods and landmarks, lone trees, etc., are not really suitable for machine-gun positions or observation posts.

The second point where improvement is necessary is camouflage. One has very often the impression that people just haven't grasped the meaning of the word. Camouflage means fitting troops, weapons, equipment, and positions into the landscape. Camouflage that suits one type of ground and one season is nonsense in another type of ground and at another time of year--think of wearing a white snowcoat in the summer. Camouflage is also a matter of time. Positions must be camouflaged before you begin to dig them; observation posts must be camouflaged before you man them; approach roads must be camouflaged or masked before you use them. The basic principle is therefore: camouflage first and dig after, but not vice-versa. People often say: "The enemy isn't firing." Certainly, but he is looking. And as we note down everything we see and plot it on maps giving time and place, and take it to heart, it is clear that the enemy does it just as much. Hence the loss of the most important observation posts at the most critical moment, and the snapping up of runners or reserves on routes which have become known to the enemy. Our troops must have this hammered into them day by day and hour after hour, because such mistakes, though they may not have immediate repercussions, come home to roost sooner or later. In this connection senior officers must set a good example. Well may a brass hat, visiting a front line, expose himself to a little danger to cheer up the troops; in point of fact such conduct seldom draws enemy fire. But if senior officers give away an observation post by their visits, by even so much as one incautious visit, enemy fire is likely to come down later on that observation post and knock it out just when it is needed, which was certainly not the original intention. Don't say that this precaution is exaggerated and unworthy of senior officers. In our opinion everything is wrong which hands it to the enemy on a plate, and everything right which increases defensive capabilities. Our people often lack a sense for little finesses, e.g., use of light and shadow, wariness as regards background. Some time ago we were shown a so-called camouflage suit in use by our enemies, extremely well-made, although to use it ourselves would load our infantry overmuch; but this type of camouflage suit might well be used for training in our reserve battalions. Our people are extremely inventive when they once have something to go on and, having been trained in this way, they might well start making themselves similar suits.

The third essential is a clear recognition of the value of digging. The German soldier does not like to dig; that is a fact we have to recognize and take measures against in our theoretical and practical training. The Russians are extremely clever in their field fortifications. This dislike of digging comes from the German soldier's innate desire to attack. "We're going forward again soon, what's the point of digging?" Nevertheless our regulations, based on the experience of the last war, emphasize at a number of points the necessity for digging,

including during the attack. The regulations say that the troops must so "settle themselves in" in the ground during breathing spaces in the attack that they are exposed as little as possible to enemy fire. In other words: dig in. To say that digging blunts the "edge" of the attack is wrong, because those troops who save their skins in a hole can and will carry forward the attack when the time comes; whereas those who have been killed or wounded in the open are out of it. Hense the prime necessity for convincing junior commanders and troops of the value of digging. But no amount of sticking spades into the ground to "show where the trench should be" will get you there. We must have more, much more, digging. It may cost time and sweat, but it will save lives later. There is no necessity to insist on a regular trench-system in all its ramifications. What is necessary is to teach a man during his training to dig in sufficiently to disappear as soon as possible from the surface in a hole or hollow. We do find in fact that our people recognize this, but unfortunately often only late, after they have had personal experience of men dying because they hadn't dug while men in shallow holes remained alive. A thousand unnecessary fox-holes do less harm than one hole dug too late. Only a cat has more than one life.

The construction of obstacles of all kinds and the laying of wire, etc., should also be very much emphasized. Preparing a village for defense is an art; but we have now learned the proper obstacles to use, and our troops in training should be given the chance to practice with these in a practical manner.

The fourth essential is the recognition of correct behavior, even in quiet periods. We pointed out above what happens to an observation post which is given away, but there are many other instances of this kind. Machine-gun positions are built which stand out like haystacks. They get beautifully camouflaged, but then someone forgets to shut the back, so that the enemy looks straight through them. A CP is set up and becomes the center of footpaths coming in from all sides--which, of course, immediately gives it away. Or you see signs "Look out! Ground covered by enemy!" Now you would think that people would take some notice of this and use the little detour which perhaps takes a quarter of an hour longer.--Nothing of the sort! "The enemy isn't firing and, if he does fire, he won't hit me." This is wrong, of course. Why the sign in the first place, if it isn't? Under this heading also falls the mobile conduct of defense, by which we mean the system of defense in depth introduced after 1916. This means that the main battle zone is a belt in depth. But we have many people who say that the German soldier stays where he has dug himself in. This is naturally correct in so far as it implies that the way through the zone only goes over his dead body. But does this mean that the man has to remain in one spot once the enemy has seen him? Certainly not. In other words, firing positions intended for defense must remain as far as possible unrecognized, which they will only be if no one uses them. We also speak generally of "silent"* machine guns. What happens in practice? Our people are too tired to take their machine gun to an alternative position, saying, "They won't spot us--not at once anyway." This is sheer wishful thinking, and leads sooner or later to a catastrophe. The same

*"Silent" machine guns are set up in the main defensive position out of sight of the enemy and do not participate initially in the combat; they overwhelm the enemy at close range with surprise fire just before he penetrates the position, or after he has already broken into it.

may be said of observation posts, many artillery positions, CPs, and other military localities. Variety in the siting of outposts, in the routing of patrols and supply convoys is also very much neglected through laziness.

The last point is a purely tactical question. Field Service Regulations speak of a main battle zone whose forward edge is the main line of resistance, i.e., a line which is to be marked out on the ground. But we do hear talk today that the main line of resistance does not suit modern conditions and that positions must be manned by "strongpoints." Apart from the fact that we have not yet seen any official amendment to Field Service Regulations to this effect, we cannot approve this view. Field Service Regulations talk about positions to be sited irregularly and in great depth; it goes on: "At particularly important points, strongpoints containing a number of different types of weapons may be made; neighboring positions must be able to give each other mutual support; eventually, covered communications between all defensive positions must be provided." A difference is obviously made between "positions" and "strongpoints," but only insofar as a "strongpoint" is a "larger position containing a number of different types of weapons." Now if you say that defense is to be "by strongpoints" inasmuch as a number of strongpoints are set up and sited for all-around defense ("hedgehogged off," as the pedants say) and that by reason of this there is no necessity for mutual communication or support, that is a false conclusion. No enemy is going to be so foolish as to attack these so-called strongpoints from the front; he will infiltrate in between them and eventually break in and finally through; these islands of defense, cut off from one another and from any supply from the rear, can and have held for some time, but are sooner or later bound to capitulate unless relieved by a really strong immediate or planned counterattack. But if such strong reserves as those counterattacking were there from the first, one is led to ask why they weren't used from the first in the forward positions. No sensible person lets a burglar inside his house for the purpose of throwing him out again; you make sure from the start that he doesn't get in. In the tactical sense you do that by manning the main battle zone in breadth without any gaps, i.e., by keeping contact to the flanks and also in depth so far as the forces are available, and by giving units regulation frontages.

13. RUSSIAN NOTES ON FLANK SECURITY IN A BREAKTHROUGH

The following is extracted from an article written by two Russian Colonels and published in the Soviet Army newspaper, Red Star.

* * *

a. General

In a modern military operation the flanks play a decisive role because of their vulnerability. In any type of battle, success will in a large measure depend on the action on the flanks. In the attack, the principal stress in much of present-day fighting is laid on widening of the flanks and consolidating the corridor created

by the breakthrough of enemy positions. In the defense every effort is bent toward holding the positions on the flanks of the hostile breakthrough and cutting the enemy wedge by counterattacking.

b. Consolidation of Flanks

In choosing the direction for a breakthrough, it is unwise to leave enemy strongpoints on the flanks. It is necessary, however, to consolidate the flanks and widen them with all means available simultaneously with the advance. Experience has proven that the Germans launch their counterattacks primarily against the flanks. Rapid maneuver of reserves is the basis of German defensive tactics. Therefore, maximum flank security must be the prime consideration. Units must be designated to consolidate the flank terrain and widen the sector of breakthrough immediately after spearheads have been driven into the enemy lines.

It is not sufficient for flank security to use large numbers of troops only. These flank troops must have a maximum of equipment and be able to throw up strong field fortifications in case of change-over to defense under heavy enemy pressure. It is most important to hold the flanks until breakthrough units wipe out the whole system of the enemy defense. Wide use must be made of all types of obstacles, including minefields, on the flanks.

c. Ratio of Width of Breakthrough to Depth

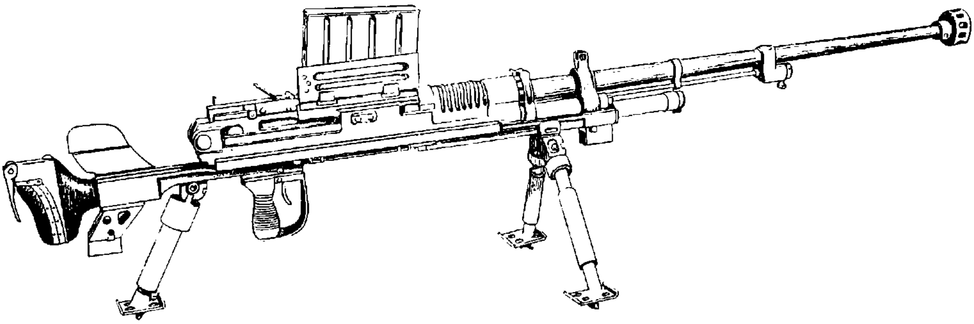
It has been established that the desirable ratio between the width and depth of the sector of breakthrough is approximately 1 to 2. For instance, if the width of the breakthrough is 4 miles, the depth should not exceed from 8 to 9 miles. If the units brought into the breach encounter fresh, strong reserves in the depth of the enemy positions, it is necessary to throw in new forces, an operation possible only when the gap is sufficiently wide.

ORDNANCE

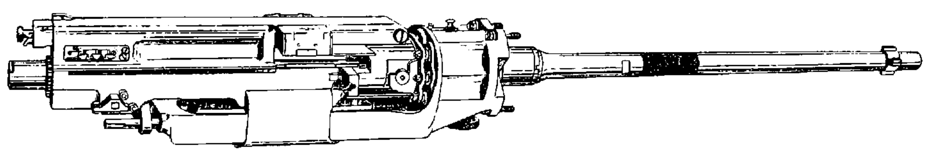
14. TYPES OF 20-MM WEAPONS

The 20-mm-type automatic gun can be traced back to the German Becker 20-mm gun of 1918. After World War I the patents were sold to a Swiss concern because of treaty limitations on German armament, but in 1928 the Oerlikon Company of Zurich, Switzerland, a German-controlled concern, took over all these patents and turned out the Oerlikon 20-mm gun. The German-controlled Waffenfabrik Solothurn Company of Switzerland shortly thereafter produced the "Solothurn"-type gun. In 1916 the French developed a 37-mm semi-automatic gun for aircraft use. This gun was redesigned during the period from 1920 to 1930 and appeared in the 20-mm series now known as the Hispano-Suiza type.

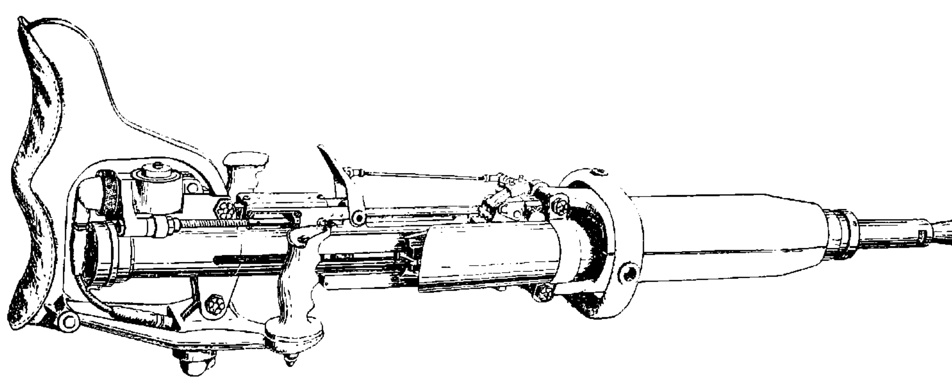
At the present time, the following 20-mm weapons or their prototypes exist:



JAPANESE 20-MM AT GUN



GERMAN 20-MM AIRCRAFT GUN TYPE 151 (MAUSER)



GERMAN 20-MM AIRCRAFT GUN (OERLIKON)

Name	Countries Used By	Type of Action and Feed	Use
Solothurn	Germany	Recoil, magazine	AA/AT
Oerlikon	United States, England, Germany, Japan, and others	Blowback, magazine	Aircraft & AA/AT
Mauser	Germany	Recoil, magazine or belt	Aircraft
Hispano-Suiza	United States, England, France, and Germany	Gas release, blow-back drum or belt	Aircraft & AA/AT
Madsen	Denmark and other countries	Recoil, belt	Aircraft & AA/AT
Breda	Italy and other countries	Gas-operated, magazine	AA/AT
Isotta-Fraschini	Italy	Gas-operated, strip feed	AA/AT

Three types of 20-mm weapons now in use are illustrated in the accompanying sketches.

15. JAPANESE AIR BOMBS

Presented herewith are some general notes on Japanese bombs and a listing of the types most commonly used.

a. Construction Details

Japanese bombs, in general, are made of steel and are not usually streamlined. Except for the armor-piercing and semiarmor-piercing bombs, they are of three-piece construction. The noise and tail units are either screwed in, welded, spot-welded, riveted, or attached by means of screws tq the body of the bomb.

The tail cones of some general-purpose bombs are filled with explosive. In these bombs, the body and tail unit are filled in separate operations and are later screwed together.

Japanese bombs use either nose and/or tail fuzes. The nose fuzes are screwed into the nose. The tail fuzes are either screwed into the base plate, or into the apex of the tail cone if the tail unit is filled with explosive.

b. Fillers Used in Japanese Bombs

The several types of fillers for Japanese bombs are listed below. As a rule, they are very toxic and should not be permitted to come in direct contact with the skin.

Trinitroanisol	Hexanite and anisol
TNT	Lyddite (cast picric acid)
Symtrinitroanisol*	Picric powder

c. Types of Bombs

Antipersonnel	Incendiary
1 kg (2.2 lbs)	1 kg (2.2 lbs)
15 kg (33 lbs)	60 kg (132 lbs)
30 kg (66 lbs)	70 kg (154 lbs)

Gas Bomb	Illuminating Flare
50 kg (110 lbs)	33 kg (73 lbs)

High Explosive

50 kg (110 lbs)	250 kg (550 lbs)--semiarmor piercing
60 kg (132 lbs)	800 kg (1,760 lbs)--armor piercing
63 kg (139 lbs)	
250 kg (550 lbs)	

GENERAL

16. NOTES ON JAPANESE TACTICS ON ATTU

It took the American forces just about 3 weeks to finish off the Japanese on Attu. A brief report by an American observer on some Japanese tactics used during this operation is contained in the following summary. For further information concerning the Japanese on Attu, see Tactical and Technical Trends, p. 38, No. 27.

*   *   *

In general, nothing new was learned at Attu about Japanese tactics other than what has already been reported from other contacts with this enemy. The Japanese are good soldiers, are courageous, but they can be whipped. Although they show signs of fanaticism, particularly in local counterattacks, they can be

*36 percent hexanitrodiphenylamine and 64 percent trinitroanisol.

forced to withdraw when they are outmaneuvered. As has been previously reported, they do not like artillery fire, and on Attu they would not fight when dominant terrain had been secured above them. They do not allow themselves to be captured alive.

As has been reported from other theaters, the Japanese make extensive use of snipers, attempting to infiltrate these men in the rear and on the flanks of American units. The initial fire from these snipers is harassing but it is not dangerous. This point must be emphasized to green troops. To the best of my knowledge, during the period from May 11 to May 19 inclusive no casualties were caused to the Northern Force by enemy snipers. It is necessary, however, when advancing over terrain which offers concealment to snipers, to thoroughly comb every square foot of area to the rear and flanks in which snipers can hide. These men are trained to fight like animals, in that they can lie motionless for hours at a time and thereby avoid detection. Their weapons (both rifles and machine guns) gave little flash and no smoke, with a result that it is difficult, if not impossible, to place long-range fire on them and they must be routed out by thorough patrol action.

The Japanese on Attu made highly effective use of their AA artillery as field artillery, placing fire both as air bursts and impact bursts.

As has been previously reported from other theaters, the Japanese are prone to counterattack "at the drop of a hat." At Attu, contrary to what had been expected, the Japanese did not counterattack under cover of darkness, all counterattacks being made during daylight hours. The Japanese on Attu, however, did attempt to infiltrate snipers into our positions during the hours of darkness.

They preferred to do their fighting on ridge lines rather than in valleys and, as has been reported from other theaters, they do a great deal of their fighting from the reverse slope of ridges and hills. On numerous occasions, when the ridge line had been taken, the Japanese would drop down the reverse slope to just below the military crest; from these positions they would wait for the American troops to come over the top, whereupon they fired not only with rifles and machine guns, but with 50-mm grenade launchers. The taking of a ridge line therefore required the taking not only of the crest of the hill, but of the reverse slope as far as, and including, the military crest. Many Jap counterattacks were launched up the reverse slope of a ridge from just below the military crest, on terrain so difficult that it was necessary for the enemy to crawl on all fours in order to advance. In doing this, however, they presented excellent targets for American troops armed with both the M1 rifle and hand grenades, and none of their counterattacks against the Northern Force were successful.

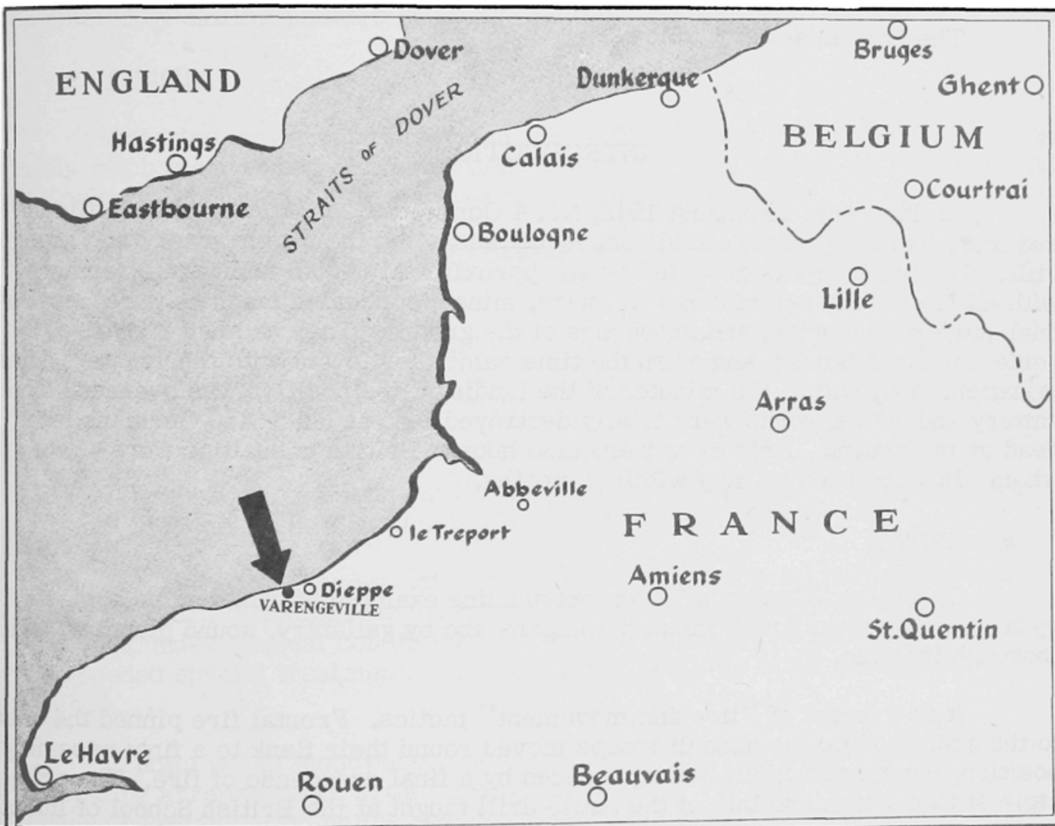
American troops with the Northern Force on Attu were in agreement that the most effective weapon that the Japanese infantry had was the 50-mm grenade launcher. On Attu the Japanese used no booby traps and no barbed wire. All enemy dead were carrying gas masks.

SECTION II

COMMANDO RAID ON VARENGEVILLE, FRANCE
(19 August 1942)

COMMANDO RAID ON VARENGEVILLE, FRANCE
(19 August 1942)

The following is an account of a British commando raid on Varengeville, which is about 3 1/2 miles west of Dieppe on the northern coast of France. This raid occurred on 19 August 1942, and was a subsidiary operation in the large-scale raid on Dieppe. It was designed to, and in fact did, destroy a German coastal battery which covered the approaches to Dieppe. The account of this action is here reprinted, with some minor editing for U.S. readers, from a British pamphlet.



In order that this account may be more understandable, a brief summary of commando organization is given below. In this connection it should be noted that while a "commando" generally consists of six "troops," only four "troops" were used in this particular operation.

The commandos adhere closely to the guerrilla system, in which small bands join together to form larger but easily manageable units. The basic organization is a "troop" of 62 enlisted men, commanded by a captain and divided into two sections under lieutenants, a section being the usual complement for one

landing craft. Sections are composed of subsections (squads) commanded by sergeants. The commando proper consists of six troops. The commando proper is led by a lieutenant colonel, who makes a point of knowing every man in his organization and tries to develop among them a feeling of personal attachment and mutual confidence. In addition to the six troops, there is in each commando a headquarters of 7 officers and 77 enlisted men organized in Administrative, Intelligence, Signal, and Transport sections; also, there are attached 1 surgeon and 7 men from the Royal Army Medical Corps and 2 armorers from the Royal Army Ordnance Corps.

The British account follows.

* * *

INTRODUCTION

At daybreak, 19 August 1942, No. 4 Commando, consisting of 252 officers and men, including seven allied* personnel, assaulted the 6-gun battery at Varengeville. The position was defended by an approximately equal number of Germans, with all the advantages of concrete, wire, mines, concealed machine guns, mortars, dual-purpose flak guns, and knowledge of the ground. They had had 2 years to perfect these defenses, and when the time came they fought with the greatest determination. Yet, within 100 minutes of the landings, the position was overrun. The battery and all its works were totally destroyed, and at least 150 Germans left dead on the ground. Prisoners were also taken. British casualties were 45, of whom 12 were back on duty within 2 months.

a. General

Operation "Cauldron" is an outstanding example of what can be achieved by troops armed only with infantry weapons and by gallantry, sound planning, and thorough training.

It is a model of "fire and movement" tactics. Frontal fire pinned the enemy to the ground while the assault troops moved round their flank to a final assembly position, the assault itself being preceded by a final crescendo of fire. The principle of this attack and that of the battle drill taught at the British School of Infantry are the same.

This account is published in order that all may benefit from the story of a stimulating achievement. To obtain full value from it, officers and NCO's should first study it as an indoor exercise and then be told what actually happened on the day.

It should be borne in mind that this is merely an episode in a major operation in which the main brunt of the fighting was borne by the Canadian forces.

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*i.e., personnel from other than British units.

b. Planning

The soundness of the plan is a major factor in any success. This observation is true of operation "Cauldron." The plan was simple, flexible, and understood by all ranks. Its thoroughness was based on a detailed study of the information obtained from German dispositions. It was animated by the will to gain surprise.

However, good plans are not enough to command success; they must be completed by skillful and determined execution.

c. Training

Waterloo may or not have been won on the playing fields of Eton; it is certainly much truer to say that operation "Cauldron" was won on the training fields of England. The outstanding features of the training were the:

(1) Accuracy with which the nature of the various actions was foreseen.

(2) Soundness of the training program, which resulted in the soldier's meeting the sudden events of the day with the confidence of a highly trained athlete hearing the expected starting pistol for his race.

(3) Implicit confidence of the troops in their weapons--the culmination of months of practice in all phases of the fire fight.

All operations have special features for which special training is needed. In this one, cliff climbing, the use of scaling ladders, employment of bangalore torpedoes under unusual conditions, and measures for embarkation and reembarkation needed special treatment. This was given until, as in all else, perfection was reached.

A point which most people would miss was the elaborate care with which the seating arrangements in the landing craft had to be made; this was necessary because reorganization on the beaches would have meant death to many. It was not until after a heart-breaking number of trials that the right solution was arrived at.

Details of training are noted in the Appendix.

d. Execution of the Plan

It should be borne in mind that this Commando attack was purely an infantry operation, unassisted by other arms.

The operation brings out, yet again, how much the inflicting of heavy enemy casualties at comparatively light cost to ourselves is due to a sound appreciation of infantry fire power and to the team work, efficiency, and discipline of the troops.

It is interesting to note the high number of Germans killed by infantry weapons while the enemy was behind cover. This success was due to the special training of the troops in "accuracy shooting."

The application of successful mortar fire throughout the operation--the 3-inch from an OP 800 yards in front of the piece, using both wire and radio, the 2-inch boldly used in its correct role--is a lesson to all.

The high number of casualties inflicted by rifles and Bren guns [a light machine gun] fired from the hip at short range during the actual assault was a just reward of the previous careful training.

e. Lessons

Lessons, that should be looked for in the account of the action, are:

(1) Weapons

(a) Rifle

The large number of Germans who fell to our rifles had had their death sentences signed many months before, when the commando struggled to perfection in judging distance and shooting straight.

(b) Sniper

A special mention must be made of the snipers. It was made very clear to the Germans that a stalker with a quick and sure eye, cunning, field craft, and the sniper's rifle with its telescopic sight, can do much to swing the battle against them.

(c) Bayonet

There is something about a bayonet that defeats not only the armchair critic but, what is more important, the enemy. The German has always hated it.

(d) Grenades

AT rifle grenades were useful against enemy behind defenses, but the incendiary bullet was not a success. Its use invariably drew fire. HE hand grenades were useful, though it appears that the Germans can throw their stick grenades farther.

(e) Bren Gun

The Bren gun did what was expected of it. Thanks to concentration on judging of distance, accuracy of fire, and the use of cover, many Germans were killed by Bren fire. Considerable training in firing it from the hip during the assault pro-

duced striking results.

(f) Tracer

It was agreed that the psychological effect of tracer at night is very great. It is necessary that inoculation against this effect should be undertaken without delay. The demoralizing effect of tracer, which always appears to be going to hit you, is very great.

(g) Mortars, 2-inch and 3-inch

Extensive training and practice were undertaken to ensure a high degree of accuracy and speed in obtaining fire effect. During the operation, as the narrative shows, this training probably went far to ensure the successful end of the operation.

(h) Tommy Gun

Extensive training was carried out in the use of the tommy gun in assault and in-fighting. Results obtained were good, but the Bren proved a more effective weapon when used from the hip in similar circumstances.

(2) Minor Tactics

Training in fire and movement was carried out over country similar to that fought over, with special regard to close-country fighting. All personnel were thoroughly prepared for their various parts in all phases of the action. This careful study and preparation was the main reason why such a small infantry force was able to defeat approximately equal numbers of an enemy who was organized behind wire and occupied strong prepared defenses.

Training in the use of smoke at the right time and place, and in suitable quantity, resulted in the saving of many casualties at critical moments.

The success obtained in this operation bears out the principle of thorough and detailed training in the basic infantry tactics--fire and movement.

PART I THE PROBLEM

a. Object

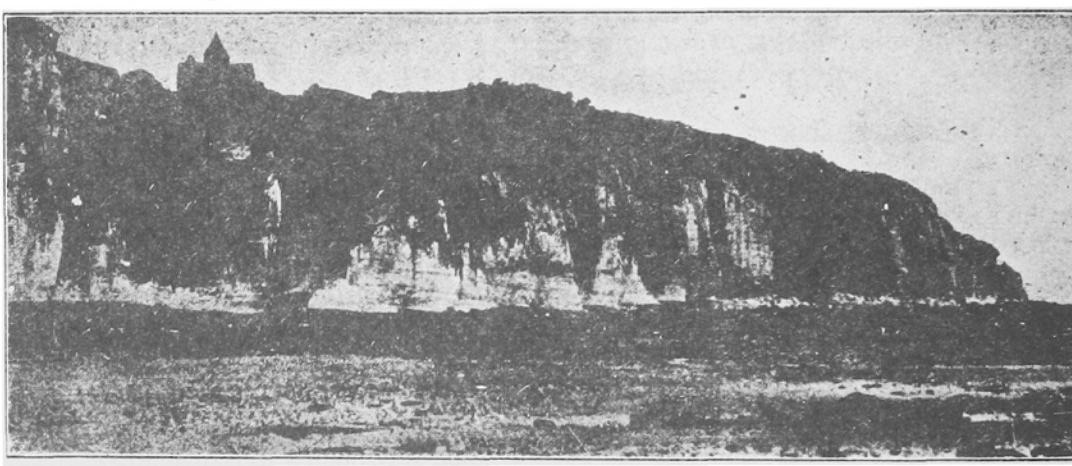
"Cauldron" Force's orders were to destroy the battery near Varengeville with all speed and at all cost. This preliminary operation was essential to the larger plan for the raid on Dieppe, since the battery covered the Dieppe approaches and it was not possible to send in the large landing craft until the battery had been silenced. "Cauldron" Force landings were not to begin before 0450.

b. Ground

The accompanying sketch-map shows all features of significance that could be detected from air photographs.

The battery position near Varengeville (three and a half miles west of Dieppe) is 1,100 yards from the sea. The cliffs are steep and unbroken except at Beach One and Beach Two. At Beach One, two precipitous gulleys led up to wooded country running within 300 yards of the battery. Beach Two, near the mouth of the river Saane, appeared the next possible landing place.

A photograph of the chimney on Beach One is shown below.

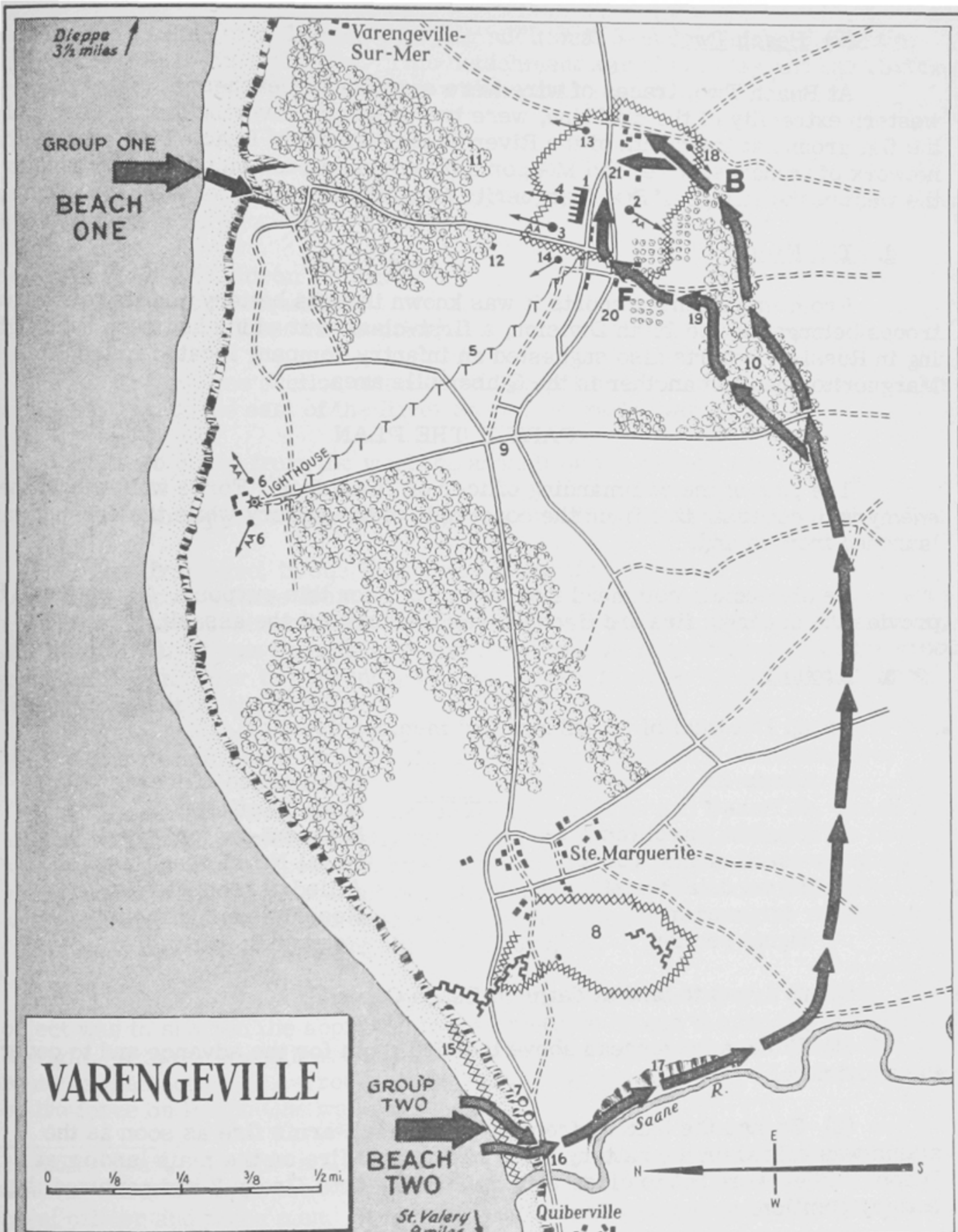


c. Defenses

Air photographs showed no indication of defenses along the cliffs or at Beach One.

(1) Beach One

In the battery area, wire could be seen on all sides except to the west. The gun positions (1) were seen to be concentrated. Two light AA guns were located at (2) and (3). Only one MG position (4) was definitely located, but it was expected that others were similarly placed to cover the re-entrant angles of the wire, and the road approaches. A telephone line (5) led from the battery position to the lighthouse. This was thought to be an OP. Last-minute reconnaissance reported two light AA guns (6) in the lighthouse area. The battery area was considerably built over and consequently difficult to interpret. Subsequent events, however, revealed that the intelligence, in general, was correct. Additional information is shown on the sketch map and will be described during the narrative.



Dieppe 3½ miles
Varengeville-Sur-Mer
GROUP ONE
BEACH ONE
LIGHTHOUSE
Ste. Marguerite
B
F
VARENGEVILLE
0
1/8
1/4
3/8
1/2 mi.
GROUP TWO
BEACH TWO
St. Valery 9 miles
Quiberville
Saane R.
E
N
S
W

(2) Beach Two

At Beach Two, traces of wire were seen on the beaches; at (7), at the western extremity of the cliff line, were two pillboxes covering the beaches and the flat ground at the mouth of the River Saane. Inland of Beach Two, a complicated network of trenches, wire, and MG posts (8) could be seen on the high ground to the west of the village of Ste. Marguerite covering the valley of the River Saane.

d. The Enemy

From intelligence reports it was known that the battery and its protective troops belonged to the 110th Division, a first-class unit which had seen hard fighting in Russia. Reports also suggested an infantry company located in the Ste. Marguerite area and another in the Quiberville area.

PART II THE PLAN

The plan of the commanding officer of "Cauldron" Force was to hold the enemy with covering fire from the coast side of the battery while the assault was launched from inland.

He divided his command into two groups for this purpose. Group 1 was to provide the covering fire and Group 2 was to carry out the assault.

a. Group 1

Group 1, a total of 88 officers and men, consisted of:

- Group Hq
- C Troop*
- Combat patrol (one section of A Troop)
- Signal detachment for mortars
- Signal section
- Intelligence officer
- Medical officer
- Sergeant-major
- Royal Naval beach master
- Allied personnel
- Reserve ammunition carrying party

Group 1 was to land at dawn on Beach One and:

(1) Form a bridgehead above the cliff, both for the advance and to cover the withdrawal.

(2) Engage the battery frontally with small-arms fire as soon as the alarm was raised or the battery itself had opened fire on the main landing at Dieppe. They were not to close with the battery until Group 2 had captured the battery position.

*Troop Hq plus two Sections for a total of three officers, 52 enlisted men.

A detachment of 10 men carrying additional 3-inch mortar ammunition was to be landed after daylight. This detachment was also to lay and light smoke generators on the beach to cover the withdrawal.

b. Group 2

Group 2, a total of 164 officers and men, was to land in two waves on Beach Two. It consisted of:

CO "Cauldron" Force	B Troop
Force headquarters	F Troop
A Troop (less one section)	Allied personnel

A Troop, less section attached to Group 1 as a combat patrol, was to land on Beach Two to the east of the River Saane. Its tasks were:

(1) To cover from the west the assault on the battery position.

(2) During the withdrawal, to protect the flank from attack from the west.

The first wave, in one LCA* consisting of a section of A Troop was to land under cover of fire from an LCS** at the east end of Beach Two and overcome any immediate opposition to the landing of the second wave, particularly from the 2 pillboxes (7). It was then to move by the shortest route to the area of the cross-roads at (9), in order to prevent the enemy in Ste. Marguerite from interfering with the assault on the battery.

The remainder of Group 2, in four LCAs, was to land on Beach Two.

The second wave, consisting of B and F Troops and Force Hq, was to follow after a 3-minute interval, slightly farther to the west on the beach. This force was then to move at all possible speed up the valley of the Saane for about 1,000 yards, and then turn east and move 1,900 yards farther to a wood (10). The LCS was to lie off Beach Two and oppose by fire any attempt to bring up reinforcements from the Quiberville area along the coast road.

Alternative plans were prepared for use if the landing was delayed. Their object was to shorten the approach to the objective should the landing take place in daylight. If there was slight delay, the main force was to take the same direct route as the section of A Troop. If the delay was considerable, the landing of the entire force on Beach One was envisaged.

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*Landing craft, assault--a flat-bottomed boat approximately 35 ft. long by 9 ft. wide, drawing about 3 feet at the stern. Carries a maximum of 35 men. Crew of one naval officer and three men. Square bows, lowered to form ramp for disembarkation.

**Landing craft, support--a flat bottomed boat of the same size as LCA, not meant to carry troops. No disembarkation ramps. Armed with a 20-mm gun and/or a 3-inch mortar for smoke, and with twin, dual-purpose Lewis machine guns.

c. The Assault

The assault was to be delivered by B and F Troops from the wooded area inland from the battery position. Ninety minutes were allowed for the approach from the beach to the final assembly position. Covering fire was to be provided by C Troop from the front of the position, and A Troop. A squadron of four-cannon Hurricanes was to "shoot up" the battery position at H+90. The signal for the assault was three white Very lights supplemented by radio messages.

d. Points in Planning Worth Noting

(1) During the approach to the beach, the landing craft were to provide covering fire for the initial landing if required. This responsibility rested jointly on the military personnel with their automatic weapons and on naval crews with stripped Lewis machine guns.*

(2) All papers and means of identification, other than identity disks, were to be removed from personnel.

(3) Weapons and Equipment

(a) All personnel, except C Troop, carried their normal weapons. C Troop carried two extra light machine guns and an antitank rifle, together with four grenade launchers and four sniper's rifles with telescopic sights.

(b) Grenades were to be primed, magazines filled, and all arms and equipment checked in daylight the day before the operation.

(c) Ammunition and explosives to be taken were considerable, and therefore had to be widely distributed; no rations or canteens could be carried. One thousand rounds of .45 and 1,000 rounds of .303 reserve ammunition were to be landed on Beach One, and, in addition, 3,000 rounds of reserve .303 remained in LCAs. HE grenades were carried by all riflemen, and a useful number of smoke grenades were taken. Incendiary mortar bombs and bullets were also carried. Made-up explosive charges were to be carried for destroying the guns and installations.

(4) Communications

Radio communication was to be established between the two group Hqs and to all Troops. Portable radio sets were used. Communications worked excellently. In addition, nets manned by attached personnel were established from Beach One to the beach used by the Canadians on the left flank, and between Force Hq and the naval landing craft.

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*Naval crews have their primary task in working the craft and, therefore, covering fire should normally be provided by the military personnel in the craft.

PART III THE NARRATIVE

a. Group 1

At 0430 hours Group 1 was approaching Beach One. The lighthouse was flashing, but a few minutes afterwards it suddenly cut off and a few seconds later some white star shells went up from the semaphore tower beside the lighthouse. The LCA commander was asked to increase speed if possible, since surprise had apparently been lost. It was not easy to see the beach, but the flare from the lighthouse had served as a useful navigational guide, and greater precision was obtained by recognition of two white houses on the cliff which had been memorized from air photographs.

The two LCAs went in according to plan, and, by the sound seamanship of the Navy, arrived within a yard of the correct place. Troops disembarked in successive waves, and because of the prearranged plan for seating in the LCAs, no reorganization was necessary on landing. Troops stepped ashore onto dry land. Previous experience had shown that automatic weapons and particularly tommy guns are likely to jam after a wetting. As it was, one Bren gun, which had been kept pointing over the bows of one of the LCAs, had been splashed by a wave and was very sluggish until the lubrication warmed up.

It was high tide, and in less than a minute the whole of Group 1 was under the cliffs. The leading sub-section of C Troop started up the east cleft, but returned very soon to report that it was impassable. It was partly filled up by rocks from the cliff and was also very heavily wired. The west cleft was then tried, and two bangalore torpedoes were blown in the wire which also choked this exit. It was realized that the use of explosives was likely to sacrifice surprise, but progress otherwise was impossible, and time was of paramount importance.

Fortunately the explosions coincided with heavy firing farther down the coast and were not apparently heard at the battery position. Successfully negotiating the cleft, the group pushed on as fast as possible with their first task. No. 1 Section, C Troop, went forward to the front edge of the wood facing the battery, after searching some houses on the way. From No. 2 Section, one sub-section searched all the remaining houses and ground in the immediate vicinity of Beach One, while the second sub-section guarded the bridgehead around the gulley.

A Troop's fighting patrol, after cutting the telephone line from the lighthouse OP, worked round to the right of the battery and, after C Troop went into action, engaged the gun sites from windows of adjoining houses with accurate small-arms fire at a range of about 250 yards. This patrol also silenced the flak gun at (3), killing three successive gun crews. One section of C Troop entered a small salient strip of scrub (11) facing the forward wire of the battery 250 yards in front of them. Some of the enemy, including what appeared to be a cook in a white suit, were standing about unconcernedly, thus suggesting that complete surprise had been achieved.

The mortar OP was established, and the linesman went back uncoiling the wire; the time was now 0530 hours. Owing to an error of judgment on the part of the corporal in command of the mortar, who moved his weapon further forward than necessary, time was lost, and it was able to open fire only just before the final assault. Wire communication failed, and communication from the mortar OP was from the group commander's radio to C Troop radio, an arrangement which had already been anticipated and practiced.

By 0540 hours No. 2 Section of C Troop was in position between (11) and (12), and the battery was being heavily engaged by small-arms fire. The three Bren guns fired in short bursts on a prearranged plan, only one gun firing at a time; it was necessary to weigh the conflicting claims of making the maximum display possible from this direction and at the same time conserving ammunition. Each gun had 16 magazines [1 magazine holds 30 rounds] of which about 12 were fired. One was continually in action in a position in long grass only 150 yards from the battery and was not observed. Three men with sniper's rifles did excellent work. One of them, wearing suitable camouflage and with his face and hands painted green, crawled forward to a fire position 120 yards from the gun emplacement. These snipers had been supplied with incendiary bullets, as well as ball ammunition, to fire at the wooden battery buildings. This arrangement was probably a mistake, since the chances of setting a house on fire with an incendiary bullet are small, and their use seldom failed to draw fire. All three enemy MG positions at (4), (13), and (14) were successively silenced by the accurate shooting of these Bren gunners and snipers. The antitank rifle was used against all buildings from which fire appeared to be coming, but it was hard to judge its effectiveness; 60 rounds were fired by the gunner, mostly rapid at the flak tower (2) in rear of the gun sites. The gun emplacements were out of range, but an AT grenade was fired through the window of a house to silence a sniper. A short time after the enemy had been engaged with small-arms fire, the 2-inch mortar arrived. The first bomb fell short, but the second hit one of the powder dumps behind the guns and a blinding flash resulted. The time was now 0607 hours and the battery never fired again. All efforts to extinguish the fire were prevented by accurate small-arms fire.

The fire travelled and other powder dumps exploded, severely burning the German gun crews. The 2-inch mortar continued to give accurate fire behind the gun emplacements. Small-arms fire and mortar fire (with smoke just before zero hour for the assault) continued until the assault signal went up about 0630 hours. A few minutes later a German 81-mm mortar, firing from east of the battery position, got the range just as the mortar crew was beginning to withdraw, and the first three casualties occurred. Hitherto, enemy fire (mortar, heavy MG, and horizontal flak) had been consistent but inaccurate, being mostly too high. It is thought that when the 2-inch mortar position started to fire smoke, it was given away by the trails that these bombs leave while passing through the air.

Meanwhile, the remainder of C Troop had searched all the houses above the beach and the surrounding cover, killing enemy snipers. The telephone line from the lighthouse OP to the battery had been destroyed. The five or six salvos fired by the battery at the shipping off Dieppe all fell short; their failure was probably due to the cutting of this line.

Attention must now be turned from this success to the flank attack of Group 2.

b. Group 2

The five LCAs and one LCS containing Group 2 also increased speed when the white star shells went up from the lighthouse at 0430 hours. As A Troop (less one section) disembarked and began to cross the heavy beach wire (15), they came under mortar and machine-gun fire and had four casualties. The remainder of the group at once began to go ashore 150 yards farther up the beach, using chicken wire to get across the wire. They also came under fire and received eight casualties. The enemy used a concentration of tracer ammunition which, in the half light, had a most unpleasant effect on men not accustomed to it. There seems to be some doubt whether this fire was coming from high ground west of Ste. Marguerite or from the Quiberville direction, or from both. Most of the casualties were from the mortar--which, fortunately, soon lifted and continued firing at the retreating landing craft. Two medical orderlies remained with the wounded. One was taken prisoner with them; the other escorted three walking wounded along the cliff top to Beach One. One officer, leaving his boat, was hit by mortar fragments, his right hand becoming useless. Nevertheless he went on, and led a charge in the final assault on the battery, using his revolver and grenades with his left hand and accounting for a number of the enemy. He subsequently was decorated. A radio lance-corporal [private first class] was stunned by the same bomb. He recovered consciousness 10 minutes later, and, knowing the plan and that he was of major importance as being the only radioman in his section, he pulled himself together and rejoined his section, by this time in the wood. He arrived in time to give Force Hq the necessary situation report before the assault signal. A private, under heavy fire, climbed a telegraph pole and with his wire-cutters cut lateral communications along the coast; he was awarded a decoration.

As the troops were getting over the wire, three Boston [A-20s] aircraft passed overhead and drew enemy fire from the commando, who rushed to (16) and, crossing the Quiberville-Ste. Marguerite road, proceeded at the double along the east bank of the River Saane, in accordance with the plan. B Troop was in the lead, followed closely by Force Hq, then F Troop. Arrangements had been made to cover this advance with smoke if they were fired at from high ground near Quiberville. It was easy to keep direction, below a steep bank (17) that defiladed them from Ste. Marguerite and with the river on their right. The going, mostly through long grass, was heavy, since the river had overflowed its banks. The bend in the river where the force was to swing east was also easily identified. By this time it was 0515 hours and broad daylight.

The ground from the river to the southwest corner of the wood (10) was more exposed, though not devoid of cover. The more open spaces were crossed in open formation by bounds. By this time Group 2 could hear the heavy volume of small-arms fire with which C Troop were engaging the battery, and soon afterward the roar of the powder explosion, and the sheets of flames clearly visible above the trees, increased their confidence that all was going well.

On reaching the wood (10), B and F Troops divided according to plan and made their way toward their assembly areas.

B Troop moved forward inside the southern edge of the wood and then filtered through the orchard by sub-sections. Using cover, they approached the perimeter wire, where they came under inaccurate fire from a machine-gun position (18), the AA gun at (2), and from various buildings. From there on, they advanced by fire and movement with covering smoke. One machine gun was stalked and silenced with a grenade. They reached their assembly positions, just short of the main battery buildings, and reported at H+95 that they were ready for the assault.

F Troop went through the wood to (19), where they advanced under cover of smoke due north, on either side of the road, to the corner of the perimeter. Here a sergeant records that a number of Germans were surprised in a farmyard, while organizing a counterattack on C Troop. They were killed with tommy guns. Vigorous opposition was encountered from the buildings and enclosures just inside the perimeter wire, and several casualties were sustained. The troop commander was killed by a stick grenade, and one of the section officers was mortally wounded. The sergeant took over but was also killed. The third officer took over command of the troop, and, though shot through the thigh in the final assault on the battery, led his men in bayonet charges from one gun site to another. He was subsequently awarded the Victoria Cross. The troop first-sergeant was also badly wounded in the foot, but continued to engage the enemy in a sitting position; he received a decoration. Fighting their way forward and overcoming resistance, F Troop reached their line of departure for the final assault under cover in a ditch along the road immediately behind the gun emplacements.

Force Hq consisting of the commander, adjutant, two runners, three radiomen with 3 radios, and a protective section of four tommy gunners from the commando orderly room had moved forward to the northwest corner of the wood, where a heartening situation report was received from the commander of Group 1. From the same area, the section of A Troop attached to Group 1 also reported that they were in a position west of the battery position at about (20) and had inflicted heavy casualties. Force Hq now moved behind and between B and F Troops near the road junction (21), where the commander contacted officers commanding B and F Troops. The time was now H+95. During this move forward, being mistaken for the enemy, the Force Hq came under heavy fire from a section of F Troop. Radio was used to stop the fire.

At H+90, exactly on time, a low-level cannon attack on the gun sites and battery position was made by a Hurricane squadron. This attack was only partly successful, as the squadron came in mixed up with Focke-Wulfs.

The assault signal was given at about H+100. B Troop rushed the buildings to the right of the gun sites, and F Troop the gun sites themselves. The charge of F Troop went in across open ground under fire, overrunning strongpoints, and finally ended on the gun sites themselves, where all the crews were grenaded, shot, or bayoneted. B Troop had a somewhat easier task in the assault. Odd enemy

groups were overcome in underground tunnels, in the battery Hq, in the cookhouse, and in outbuildings. Two German officers were killed after a rousing chase from one house to another. The guns (both barrels and breech blocks), instruments, and most of the subterranean supplies and ammunition dumps, were blown up by F Troop. B Troop was responsible for mopping-up and for all-around defense. The gun emplacements afterwards were a remarkable sight. Dead Germans were piled high up behind the sandbag breastworks which surrounded the guns. Many of them had been badly burned when the powder had been set afire in the early stages of the operation. Bodies of men who had been sniped by C and A Troops lay all around the area, in and out of bunkers, slit trenches, or buildings.

Isolated resistance from pillboxes caused a further half-dozen casualties, since all strongpoints were enfiladed from one section of the wire to another (the perimeter covered some 50 acres); when one position was stormed and the crews killed, the commando personnel engaged came under heavy fire from the next position. Isolated snipers continued to resist from cover outside the gun emplacements. It was noted that they picked off single men moving by themselves, but appeared unwilling to unmask their position during mopping-up operations if two or more men exposed themselves simultaneously. Good use of smoke generators was made at this stage, and the smoke grenades, which explode on impact, proved particularly successful. Union Jacks for captured positions proved useful as recognition signals. The last survivors, like all the enemy encountered, fought well.

It may not be out of place to note that "Cauldron" Force Commander considers that the success of the operation was chiefly due to the excellent leadership of junior officers and to superior weapon training.

PART IV THE WITHDRAWAL

While the guns were being blown up, the force commander ordered the medical officer and stretcher bearers by radio to come up from the beachhead to the battery position. F Troop, Force Hq, and B Troop, when the demolitions and mopping-up were finished, moved successively down to Beach One, carrying their wounded and guided by elements of C Troop who were covering the withdrawal.

Meanwhile A Troop, acting as left flank guard, ambushed and shot up an enemy patrol coming from Ste. Marguerite. As an example of bad training, it is worthy of note that the enemy advanced points were too close together, and that the shot that sprang the ambush passed through the bodies of the two leading Germans.

It took some time to get the wounded through the wire, and time might have been saved had the gaps through it been widened while the operation was in progress. During the evacuation an enemy mortar began to shell the beach, but the 3-inch mortar, which had already been put in position on the beach to cover such an eventuality, returned fire, judging the position of the enemy weapon by the line of flight of the approaching bombs. This enemy mortar did not fire again. C Troop, forming the rear guard, was the last to withdraw, and did so in accordance with a frequently rehearsed drill whereby the light machine guns in pairs leap-frogged

one another, while the rear elements put up a smoke screen. Haversacks containing smoke generators had been dumped for this purpose by the troop at the top of the gulley on their way up. The withdrawal across the rocks to the LCAs was made through a lane of smoke some 200 yards wide, produced by the smoke generators placed in position during the operation. The lane was extended for about 50 yards into the sea by naval smoke floats put out by the LCS and LCAs. When the LCAs were a few hundred yards out, and no longer under the lee of the cliffs, they came under inaccurate machine-gun fire from the vicinity of the lighthouse, and further use was made of smoke until out of range.

The total casualties of the operation were 45:

Officers killed	2	Enlisted men wounded	17
Officers wounded	3	Enlisted men wounded and missing	9
Enlisted men killed	10		
Enlisted men missing	4		

No casualties were suffered during the withdrawal. Of the 20 evacuated wounded, several had carried on right through the action; 12 of the 20 wounded were back on duty within two months.

APPENDIX

TRAINING

The success of this operation was due to thorough training in all subjects. the last 3 weeks before the operation were spent in an intensive refresher course, each troop specializing for the part it was going to undertake.

The following training was carried out:

a. Individual Training

(1) A Troop

Cliff climbing with scaling ladders. Fire and movement in close country. Practice fire against full-scale model of the enemy battery. Combat patrols. Street fighting.

(2) B Troop

Fire and movement in close country. Use of ground. Full-scale practice against model of enemy battery. House-to-house fighting and assault tactics; infighting with tommy guns, grenades, and bayonets. Mopping-up and consolidation. Rear-guard action.

(3) C Troop

Forming a bridgehead. Snipers' training. Stalk and crawl. Taking up position in front of full-scale perimeter. Firing AT rifle grenades from grenade

launchers. Mortar practice, 3-inch and 2-inch (3-inch mortars were also fired from a beach). It is of interest to note that the standard of training reached by these mortar men was such that they had scored 18 hits out of 20 rounds into a space 10 yards square, at 250 yards' range. Radio in conjunction with 3-inch mortar. A fighting withdrawal and final reembarkation (1) with smoke, (2) under fire.

(4) F Troop

Assault of a model of the battery position. Visits to local coast defenses by Troop NCO's and sappers. Component parts of guns and other equipment. Laying of charges. Assault tactics and combat firing.

b. Collective Training (All Troops and Force Hq)

Hardening exercises, physical training with weapons. Swimming. One-mile runs every morning before breakfast. Doubling fully loaded over specified distance in wet clothes. Assaulting over set distance on full-scale model. Crossing beach wire with chicken wire. Use of bangalore torpedoes. Fire and movement on the range; battle drill with live ammunition, bayonet fighting, and unarmed combat. Detailing of "smoke men" with 100 percent reserves and training in laying smoke. Practice in withdrawal, first as a drill, then with smoke, opposition, and casualties. Evacuation of casualties at all stages, e.g., from objective to beach, from the beach into LCAs, from LCAs into parent ship. Accommodation on parent ship and in LCAs by day and by night. Landing from LCAs first as a drill, then with full supplies and equipment. Loading of LCAs with ammunition, explosives, scaling ladders, etc. Firing of light machine guns from LCAs. Use of radios (all officers, NCOs, and runners). Practice of each troop's own role on full-scale model daily. Training in special equipment, i.e., canvas containers and bags to keep weapons and radio sets dry, special bangalore torpedoes, demolition charges, smoke grenade, and Everest carriers.* Personal camouflage, and security. French and German lessons.

* [A type of individual pack.]

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TACTICAL AND TECHNICAL TRENDS

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SECTION I

AIR

1. FRAGMENTATION BOMBS

Certain characteristics of fragmentation bombs are described in the following article, reprinted from issue No. 12 of AFGIB (Air Forces General Information Bulletin). Included in the summary is a reference to a few types of Axis bombs in this category, particularly those of a "combination" character.

* * *

In the category of "fragmentation" bombs are included certain bombs of small size designed for destructive effect on personnel, animals, and light materiel targets such as motor transport, and aircraft on the ground or in flight. Bombs of this class are generally less than 100 pounds in total weight, and are often termed antipersonnel bombs.

Whereas general-purpose demolition bombs depend for destructive effect primarily on their violence of detonation, with fragmentation a secondary consideration, fragmentation bombs depend primarily on the projection at high velocity of bomb-body fragments. The design of the bomb-body, and the charge/weight ratio, are determined with this end in view. Thus, with our demolition bombs the high explosive charge may approximate 50% of the total bomb weight; where with fragmentation bombs it may approximate only 15%.

Bodies of fragmentation bombs show a considerable variation in type. They include simple steel cases; bodies built up by winding on a steel shell a helix of strip or bar steel, or assembling on a steel shell a series of rings; and bodies consisting of concentric steel cylinders, a smaller within a larger one, with the intervening space filled with concrete containing steel fragments. The general effort is to devise bodies which will shatter into the maximum number of effective fragments neither too large nor too small in size.

Fragmentation bombs may be dropped singly or in clusters, bound or held together during a portion of their fall and then released, or in containers which operate in a similar manner. The purpose of dropping in clusters or containers is to ensure a closer concentration of bombs dropped from high levels, since bombs dropped singly would tend to disperse considerably during their fall. Such clusters or containers are generally provided with either an explosive cartridge or a spring-loaded mechanical device, which functions after a predetermined period to break open the cluster or container and free the bombs.

Fragmentation bombs produce their maximum effect when detonated at, or slightly above, ground level. A flat cone of fragments sweeping outward is highly desirable. Any ground penetration by the bomb prior to exploding narrows this cone of fragment-sweep, since many fragments expend their force in the ground, and the remaining ones take higher trajectory.

The normal fuzing is, therefore, with instantaneous impact-type nose fuze. However, time (delay) fuzing may be necessary if the bombs are to be dropped from low level, in order that the aircraft may be beyond the danger space when the bomb explodes.

In dropping from low level, the disadvantage of time fuzing is somewhat counterbalanced by the fact that the bomb is more apt to ricochet and come to rest on the ground surface, and less liable to bury itself, than if dropped from higher levels. However, low-level drop with instantaneous fuzing has been made feasible by the provision of a chute attachment for the bomb. This greatly retards the flight of the bomb, allowing the aircraft to get beyond the danger zone before the bomb reaches the ground and detonates. Release of this bomb is possible at 100 feet, and lower if tactically required.

In addition to normal types of fragmentation bombs, the Axis nations have employed some which are unusual in design, or of a "combination" character. A few of these are noted below.

The German SD* 2-kilogram "butterfly" bomb differs markedly in appearance from ordinary types. The small drum-shaped body is enclosed in a hinged shell of thin metal which opens in flight and acts as a metal braking drogue similar to a parachute attachment. The usual fuze allows either instantaneous burst or time delayed action of 3 to 5 seconds. It is thought that in some cases a disturbance-operated (antihandling) fuze may be fitted, of a type such that bombs which have come to rest on the ground are thereafter exploded by the least jar or movement.

The Italian 4 A.R.**(thermos) bomb is normally equipped with an antidisturbance fuze which functions if the bomb is moved or jarred after coming to rest on the ground. This bomb resembles a thermos bottle in general size and shape, and may attract the curious to pick it up, kick it, or otherwise disturb it -- to their extreme misfortune. It partakes of the nature of a booby trap, though it is distributed by airplanes.

It may be pointed out that antipersonnel bombs equipped with these antihandling fuzes are not only fatal to the unwary -- they are annoying and difficult to dispose of even when their nature is thoroughly understood. Thus they serve to hamper operations on ground where they have been dropped.

The Japanese 50-kilogram phosphorous pellet bomb is a dual-purpose bomb combining antipersonnel and incendiary effects. On detonation, the steel bomb-body fragments are projected at high velocity in a flat cone, and numerous phosphorous-impregnated pellets are scattered. This bomb is described as being quite effective for antipersonnel uses.

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*[SD is the designation for a bomb with a thick casing, which achieves its effect chiefly by fragmentation.]
** [Armamento Ritardato - delayed action.]

The German 2.2-kilogram I.B.E.N. (incendiary bomb with explosive nose) similarly combines incendiary and antipersonnel effect; but this bomb is primarily an incendiary, with the high-explosive and antipersonnel component added to hamper and delay fire fighters. The antipersonnel component may break off and come to rest at a distance from the incendiary portion of the bomb, yet function nevertheless. It explodes from 1 to 7 minutes (approximate time) after the incendiary portion has functioned. The delay is unpredictable, and varies with individual bombs.

During the Japanese raid on Rangoon, 23 December 1941, some ten or a dozen antipersonnel bombs fell in an open space of about 150 by 250 yards, which was laced with slit trenches. But the people were on top of the trenches and even ran out of them, with the result that 250 were killed on the spot in a few minutes. The wounds were generally terrible leg and stomach injuries. The most fatal zone was within 50 to 60 yards of the burst, but some individuals were killed up to 300 yards away.

Had these people remained in the trenches, even without overhead cover, the casualties would have been neglibile by comparison. The slit trench or fox hole provides excellent protection against small fragmentation bombs. Wherever they may be expected, a little "digging in" will pay dividends.

Corresponding destruction has been achieved on aircraft or motor transport caught undispersed in the open.

While the SD 2 "butterfly" bomb and the 4 A.R. "thermos" bomb are especially to be avoided, unexploded specimens of any fragmentation bomb should be given a wide berth. Failure of the fuze to function normally on impact may nevertheless leave the bomb in a highly sensitive condition; and the disposal of such "duds" can be safely undertaken only by specially trained personnel.

2. JAPANESE CAMOUFLAGE AND DECEPTION METHODS ON AIRFIELDS

Little use of camouflage by the Japanese has been found thus far on existing airfields or newly-constructed strips, and no extensive schemes for their concealment. What little means of concealment have been noticed may be classified as follows; (a) use of natural foliage (branches of trees, etc.) to cover objects; (b) use of nets or similar material to obscure outline; (c) use of covered "hangarettes," etc., to conceal aircraft, and (d) concealment by dispersion in woods and scrub.

Disruptive painting of buildings has been noticed infrequently. On the roof of one service hangar was noticed a disruptive camouflage, but no attempt was made to break up its sharp outline, and it was plainly visible against the light-toned background of the area upon which it was situated.

Branches and foliage were used to disguise fighter aircraft on one airfield and were found to effectively conceal details, but the aircraft had not been dispersed in the adjacent scrub and were easily detected.

The most extensive use of nets has been in the form of individual nets to disguise the outlines of aircraft. This is sometimes done merely by draping a large net over an aircraft, and at other times, by laying nets over a rough framework of long poles. Both methods achieve the desired result of making the exact study of the aircraft's form and measurements difficult; they do not mask the presence of aircraft.

Lightly built movable "hangarettes" are used by the Japanese on airfields in China, Thailand, and Burma. Sometimes these "hangarettes" stand by themselves; at other times they are placed inside the blast walls of aircraft shelters. These "hangarettes" are built of wood or of light bamboo framework covered with openwork matting. They vary in form from inverted V-section tents to inverted U-shaped structures like Nissen huts, and house-like structures with straight walls and pitched roof. They are not extensively used by the Japanese, there being only about an average of 50 on the Burma airfields photographed in the last 6 months, as against a total of over 1,000 aircraft shelters in Burma. Frequently they do not afford complete concealment and the outlines of the aircraft can be seen through the "matting." No covered aircraft shelters affording complete concealment are used by the Japanese in Burma.

Occasionally the Japanese have made use of gaps in hedges, and have dispersed fighter aircraft in these gaps so that they are very inconspicuous. This is a common practice in German-occupied airfields in Europe. There has been a recent tendency on Japanese airfields to disperse the aircraft at greater distances and with greater care, hiding them among scrub and bushes on the outskirts of the area. The sequence in disposal of aircraft in enemy-occupied Burma is interesting. During the Japanese advance in May-June 1942, aircraft were parked along runways with no attempt at concealment. This was followed by the very extensive construction, not far from the runways, of blast shelters, sometimes with internal "hangarettes." The latest practice according to photographs is, as has been stated above, toward deliberate concealment in far more widely dispersed areas.

The use of dummy aircraft and other indications to give a false impression of the presence or availability of landing grounds has been noted on several occasions. In one instance, unserviceable aircraft were lined up on the main airfield and the satellite landing strips to suggest that these were in use, when other indications showed that they were most likely to be unusable. A recent study of another airfield has shown 8 unserviceable aircraft used as dummies since the beginning of December 1942. Near another there was an arrangement of rough 2-dimensional dummies representing fighter aircraft, with dummy corner-markings adjacent, which may have been intended to constitute a decoy site for the actual airfield. A single dummy aircraft, partly 3-dimensional and partly flat, was constructed in open country near still another airfield.

3. NEW ULTRA-HIGH-VELOCITY GERMAN "88"

a. General

The well-known German 88-mm dual-purpose Flak 36 has, according to a recent British report, now been greatly improved upon in the new dual-purpose 88-mm Flak 41, which develops, without choked boring, the remarkable estimated velocity of 3,400 fs. The 36 was considered a high-velocity gun with a muzzle velocity of only 2,690 fs. As an antiaircraft weapon, the new gun is believed to have a maximum ceiling of 45,000 feet, and an effective ceiling of from 36,000 to 38,500 feet as compared to 32,500 maximum and 26,250 effective, for the older gun. This excellent performance is not the result of firing a lighter projectile. In fact, the new shell weighs 22.4 pounds against 21 pounds for the 36. The propelling charge has been stepped up from 5.34 pounds to 11.9 pounds, more than half the weight of the shell.

b. The Gun

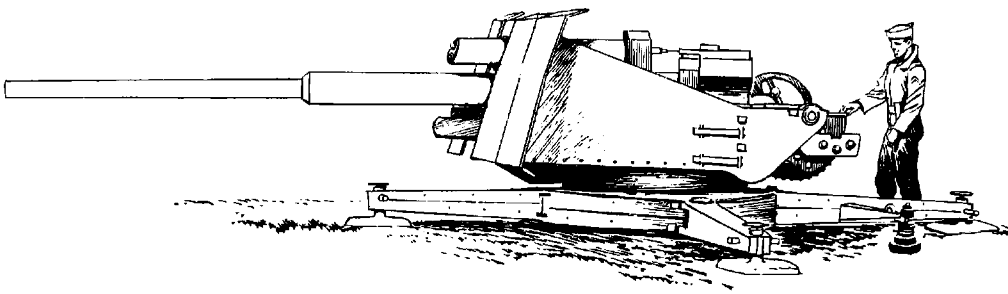
As indicated in the accompanying sketches, the new gun can be recognized by the thick sleeve that projects about a yard in front of the shield and by the longer barrel--about 3 feet more than that of the 36. In spite of its increased power, the gun is reported to be lighter than the old 88, due to a better and lighter design of the carriage. The shield has been built up on the sides, an improvement on the 36, and the gun is equipped for electric firing. According to report, the recoil mechanism is quite similar to the Flak 36, but strengthened. It is probable that some of these guns have been provided with self-propelled mounts, thus enabling them to be used for antitank as well as antiaircraft purposes. Such weapons would be a formidable answer to our own tank-destroyer with the long 155. The armor penetration at long antitank range is practically 6 inches, and the trajectory is obviously quite flat.

Against homogenous armor the performance with the APCBC* shell, as compared with the Model 36, is as follows:

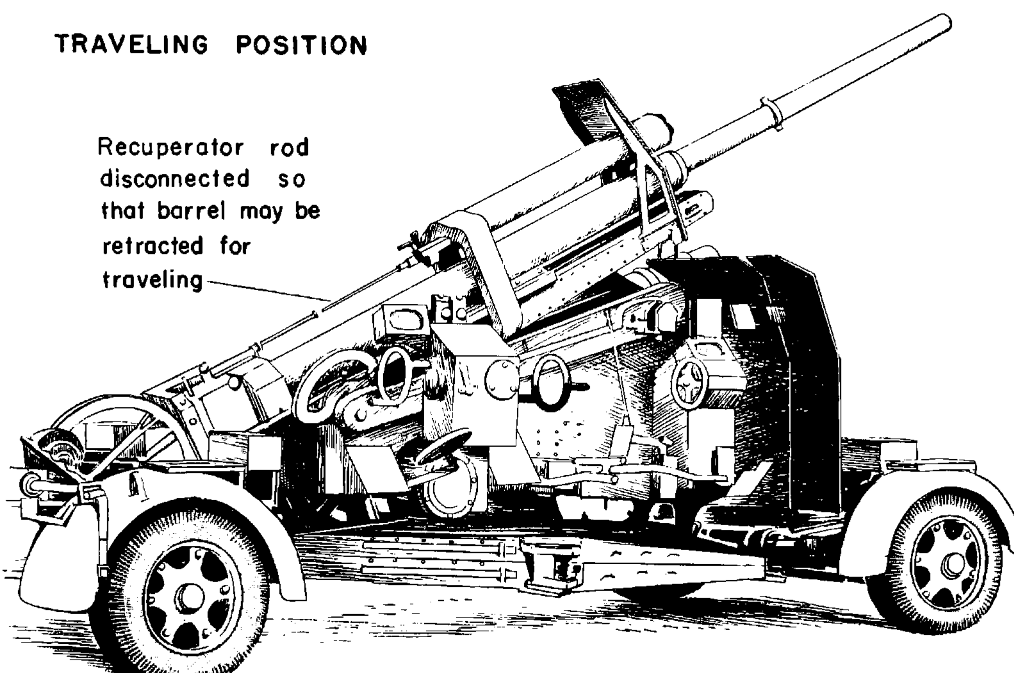
Range yards	Normal		30 Deg.	
	Flak 41	Flak 36	Flak 41	Flak 36
Point Blank	7.76 in	---	6.65 in	---
500	7.28 in	5.08 in	6.26 in	4.33 in
1,000	6.85 in	4.69 in	5.87 in	3.97 in
1,500	6.42 in	4.33 in	5.47 in	3.58 in
2,000	5.98 in	3.94 in	5.12 in	3.23 in
2,500	5.59 in	---	4.76 in	---

*Armor-piercing capped with ballistic cap (British abbreviation)

FIRING POSITION



TRAVELING POSITION



GERMAN 8.8-CM FLAK 41

c. The AP Ammunition

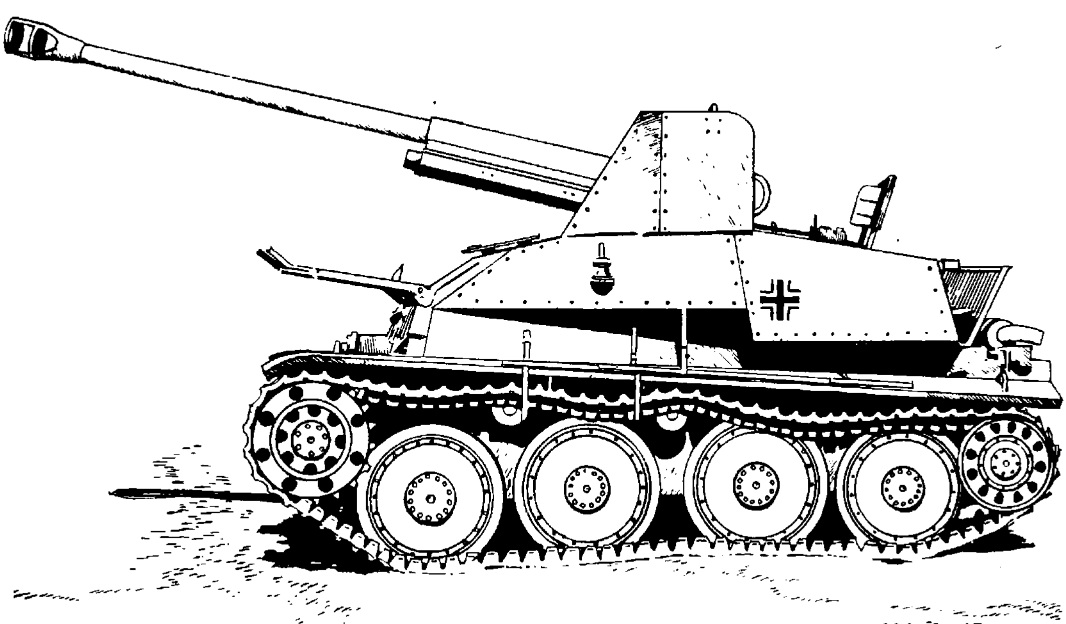
The APCBC projectile, as stated, weighs 22.4 pounds, with the remarkably small bursting charge of 2.12 ounces of HE--scarcely more than the load of some hand grenades. The decrease in the HE capacity from 1.6 percent in the Flak 36, 21-pound shell to only 0.59 percent in the 41 is in line with the German policy of decreasing the HE capacity while increasing the weight of the APCBC shell. The complete round is 45.5 inches long against 34.2 for the Flak 36. The propellant charge of 11.9 pounds is of the flashless type. While hitherto only the heavier antiaircraft guns have been electrically fired, this ammunition is fitted with an electric-type primer instead of a percussion primer. The projectile is reported to have a black-and-white tip. From documentary sources, a similar type of shell is known to exist for ordinary 88's. The rounds are stated to be packed separately in metal cylinders.

ANTITANK

4. GERMAN 76.2-MM SELF-PROPELLED GUN

Further information has been reported from official sources about this weapon, previously referred to in Tactical and Technical Trends, No. 21 , p. 6.

It appears that to date the only 76.2-mm piece reported mounted on the 38 light (t)* tank chassis is a long-chambered version of the Russian field piece 76.2-mm FK (Feldkanone, field piece 36 (r).*



GERMAN 76.2-MM SELF-PROPELLED GUN

*The letter t stands for Czech; r for Russian.

The long-chambered piece and the Russian light field piece are identical except for the following differences:

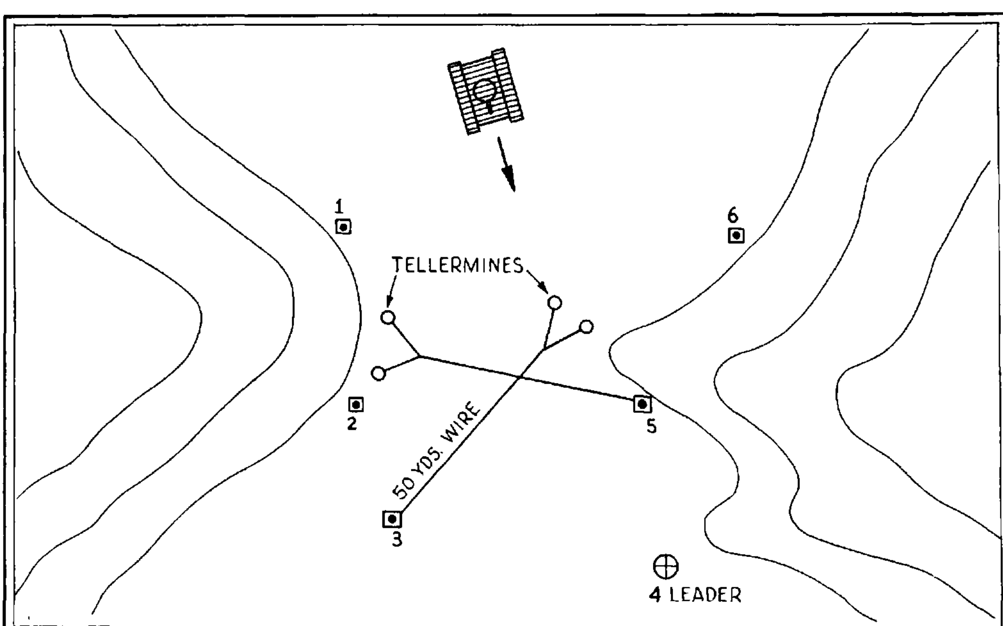
	76.2-mm as mounted on 38 (t) tank	76.2-mm FK 36 (r)
Muzzle brake	Yes	No
Length of chamber (approx)	28 in	15 in
Chamber volume (approx)	3,600 cc	1,780 cc
Maximum range (estimated)	15,000 yds	8,000 yds

Both pieces have Russian markings; however, the only known long cartridge case ammunition is of German manufacture.

It is also of interest to note that the same cartridge case is used in the 75-mm Pak 40 (antitank) as is used in the long-chambered 76.2 mm.

5. GERMAN "TANK HUNTING" TACTICS

The following information on the employment of magnetic mines by German infantry antitank squads has come from a credible German source. Six men are assigned as an antitank team, generally for night operations in positions



offering possible avenues of tank approach. The team is deployed in the form of a U at intervals of approximately 50 yards, adapting itself to the terrain for observation and field of fire.

All men are armed with machine pistols and antitank, magnetic hollow-charges. The team leader, No. 4, carries a pyrotechnic pistol. In addition, four Tellermines are carried for placing in the probable path of the tank and are controlled by a 50-yard length of wire by which they can be pulled under the approaching tank.

When a tank comes on, the team leader fires a pyrotechnic charge directly at the turret of the tank and momentarily blinds the crew. At the same time Nos. 3 and 5 pull Tellermines into its path, and No. 2 rushes forward to place the magnetic charge on the side armor plate of the tank. Meanwhile, No. 4 covers the turret-hatch to prevent the escape of the crew; Nos. 1 and 6 cover the ground behind the tank for possible infantry accompanying it. Each man is interchangeable with the others of the team and his duties are determined by the terrain.

ARMORED FORCE

6. ARMOR ARRANGEMENT ON GERMAN TANKS

The accompanying sketches show the armor arrangement on current models of the PzKw 2, 3, 4, and 6. These sketches are believed to be accurate and up-to-date. Armor thicknesses (circled figures) are given in millimeters; their equivalent in inches may be found in the article beginning on page 30. A question mark following some of these figures indicates that definite information is not available. Where two small figures appear in parentheses, it indicates that there are 2 plates at this point; in only 2 instances, namely on the PzKw 3, are the 2 plates separated to form so-called spaced armor.

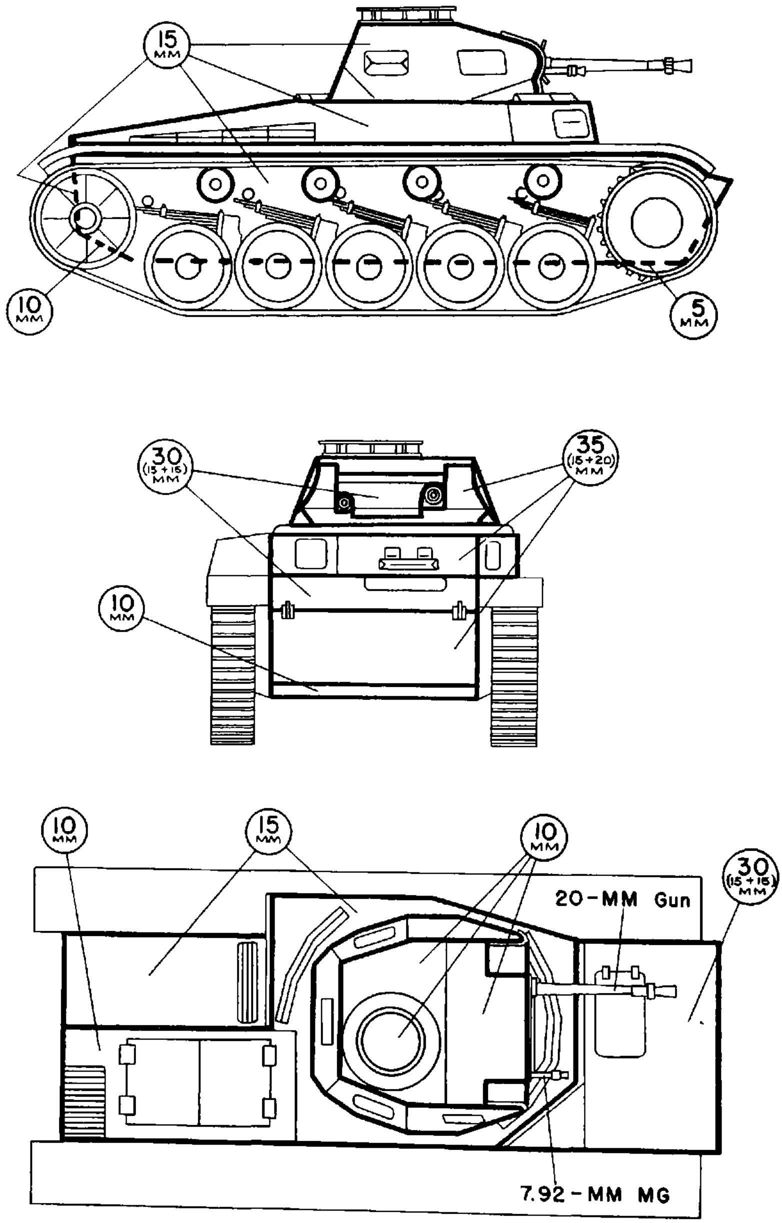
The armament of these tanks is also shown.

ARTILLERY

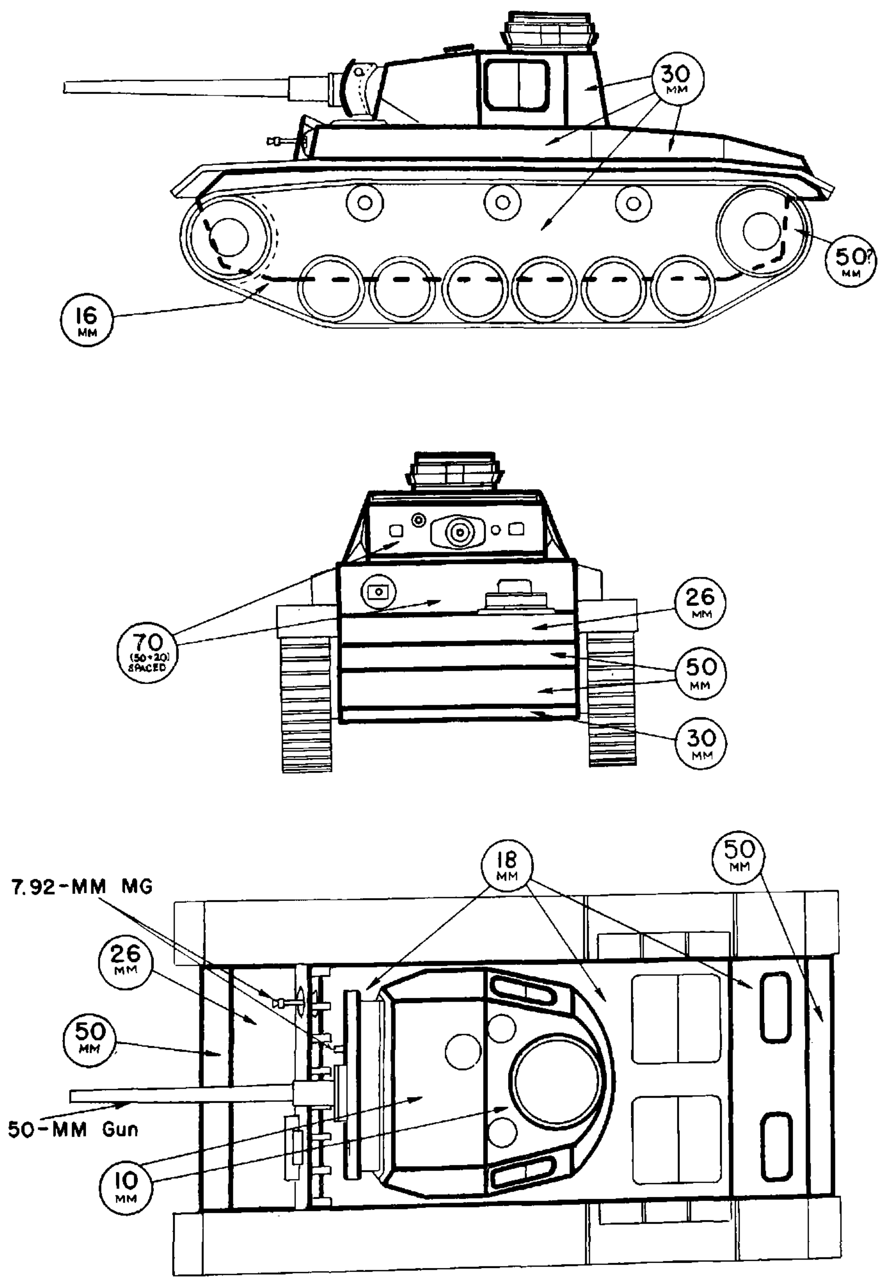
7. ARTILLERY COMMAND IN THE GERMAN ARMY

In the German Army all artillery apart from the relatively small divisional allotment belongs to the GHQ pool (Heerestruppen). Units are allotted from this pool to army groups or armies according to the estimated needs. They may be sub-allotted to corps or divisions. The commander of the divisional artillery regiment, Artillerieführer or Arfü, commands the divisional artillery when it is not reinforced from the GHQ pool.

When GHQ artillery units are attached to the division, the Arfü is usually subordinated to an Artillery Commander, Artilleriekommandeur, abbreviated Arko, who with his staff is likewise from GHQ. An Arko may also be assigned to command an allotment of GHQ artillery to a corps. When no GHQ artillery has been assigned to an army group or army, an Artillery General Stabsoffizier der

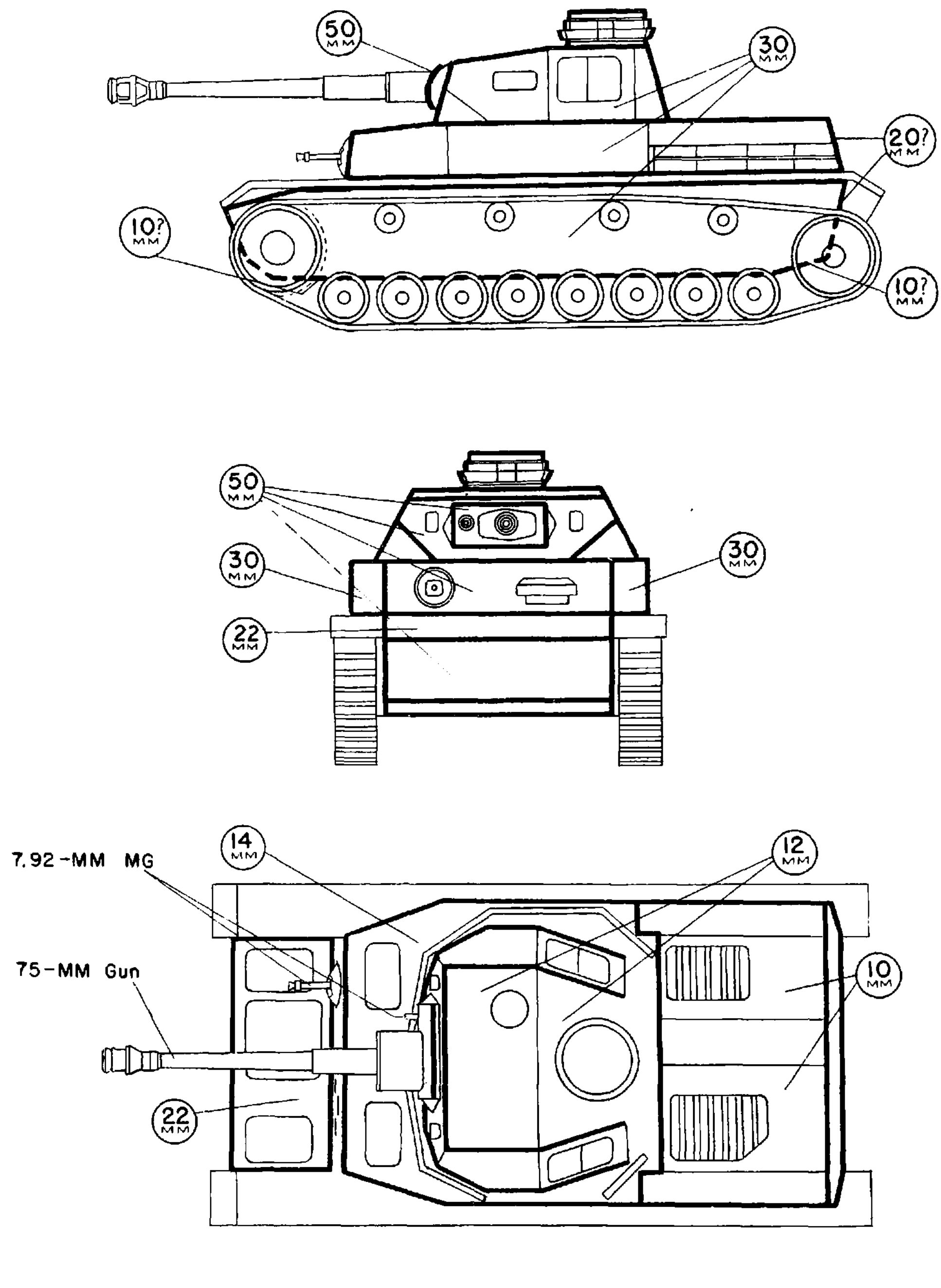

15 MM
10 MM
5 MM
30 (15+15) MM
35 (15+20) MM
10 MM
10 MM
15 MM
10 MM
30 (15+15) MM
20-MM Gun
7.92-MM MG

Pz. Kw. 2

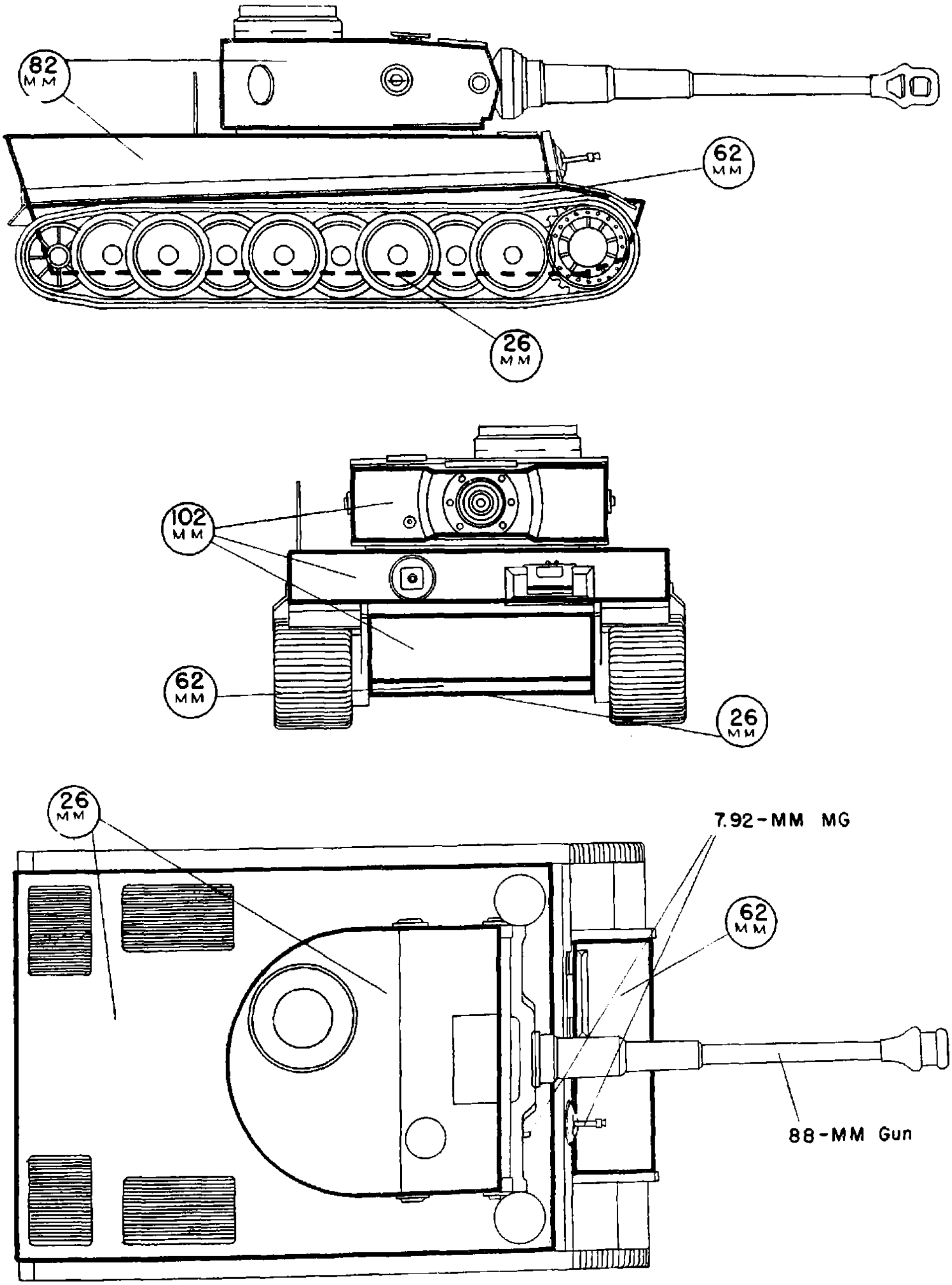


30 MM
50? MM
16 MM
70 (50+20) SPACED
26 MM
50 MM
30 MM
18 MM
50 MM
7.92-MM MG
26 MM
50 MM
50-MM Gun
10 MM

Pz. Kw. 3


50 MM
30 MM
20? MM
10? MM
10? MM
50 MM
30 MM
30 MM
22 MM
7.92-MM MG
14 MM
12 MM
75-MM Gun
10 MM
22 MM

Pz. Kw. 4



Pz. Kw. 6

Artillerie, abbreviated Stoart, advises the army group or army commander on artillery matters. When GHQ artillery units have been attached to an army, a Higher Artillery Commander, Höherer Artilleriekommandeur, abbreviated Höh, Arko, is assigned to the army. A recent report from British sources gives some interesting details as to the powers and duties of a Higher Artillery Commander of an army, and of an Artillery Commander.

a. Powers and Duties of a Higher Artillery Commander of an Army

The Higher Artillery Commander of an army is directly responsible to the army commander. He is at the disposal of the army commander for the supervision of the employment of artillery, for ground reconnaissance, and for any special tasks. He supervises artillery training within the army command and keeps an eye on the state of repair of artillery equipment. He is the commander of all army artillery directly under command of the army, as well as any of the army artillery units placed at the disposal of the Army High Command or the Army Group.

He has the right to attach himself to any unit within the army area, in which case he informs the appropriate headquarters. If he is not at army headquarters or in the immediate vicinity, an officer on his staff must be detached as liaison officer to the army headquarters. In any case, there is always close cooperation between the operational section of army headquarters and the staff of the Higher Artillery Commander.

The duties of the Higher Artillery Commander may be summarized as falling into 2 categories, namely, duties within the army area and duties within the army command. As regards all artillery within the army area his individual duties include:

(1) Organization of the employment of all methods for artillery reconnaissance, meteorological services, etc., in cooperation with neighboring armies;

(2) Control of artillery cooperation with the Air Force and with mapping and plotting units;

(3) The supervision of artillery training;

(4) Constant watch on the state of repair of artillery equipment;

(5) Participation in the delivery and return of guns;

(6) Submitting reports to the army high command as to experiences with artillery equipment;

As to army artillery within the army command his duties include:

(1) Assignment of officer personnel;

(2) Requests for, and distribution of, reinforcements;

(3) The control of supplies of weapons and equipment, clothing, motor transport, and tires.

b. Powers and Duties of an Artillery Commander

The Artillery Commander belongs to GHQ troops. He is assigned to a division or directly to a corps. He retains the right to attach himself to any artillery unit in agreement with the appropriate division headquarters. He maintains close cooperation with the higher artillery command of the army, and as regards signal matters has the cooperation of both divisions and corps signal battalions.

When under command of a division, he assumes the role of the Artillery Commander of the division. The division artillery is tactically under his command, but this need not alter its allocation to units.

As commander of corps artillery, or artillery group, he commands all artillery placed under command of the corps in accordance with the corps commander's orders. His duties include:

(1) Preparation for the employment of support artillery;

(2) Organization and use of support artillery;

(3) Fire-control of individual artillery groups;

(4) Cooperation of corps artillery with ground and air reconnaissance;

(5) Formation of an artillery signal net;

(6) Ammunition supplies.

In the corps area he is responsible for giving advice on all artillery matters, and for supervising artillery methods and training in the corps area. His duties include suggestions as to:

(1) Distribution of support artillery to divisions;

(2) Battle orders outside the division battle sectors;

(3) Tasks of artillery immediately under command of corps;

(4) Limits for counterbattery and harassing fire;

(5) Division artillery reconnaissance tasks outside the battle sectors;

(6) Regulation of artillery air services and reconnaissance;

(7) Regulation of artillery signal communications with the divisions;

(8) Provision of uniform plotting boards and range tables;

(9) Use of AA for protection of artillery;

(10) Ammunition supply.

CHEMICAL WARFARE

8. GERMAN AND ITALIAN INDIVIDUAL ANTIGAS EQUIPMENT

The following information briefly outlines the antigas equipment carried by the individual German and Italian soldier; it is based on the most recent information available.

a. German Army

(1) Gas Mask

The gas mask is always on the soldier's person, both in active theaters of war and elsewhere. German regulations give clear instructions to this effect. There has been some evidence that German soldiers in occupied countries only carry them when on duty. Recent information, however, indicates that German soldiers in Paris always carry gas masks.

(2) Personal Decontaminant

This consists of a box containing 10 tablets of Losantin carried by every soldier in the pocket of his uniform.

Losantin tablets are stabilized bleach, with an available chlorine content of 39.8 percent. They are used for treating skin contaminated with a vesicant. A tablet is made into paste with water or saliva which is then applied to the affected part; after 10 minutes it is washed or wiped off. The example of the incautious experimenter who ate several tablets under the impression that he was eating "Nazi food tablets" should NOT be followed.

(3) Antigas Sheet

The so-called antigas sheet it is carried in all operational theaters by every soldier in a satchel slung on the chest. These sheets, about 6 by 4 feet, are made of a rubberized fabric. They are designed primarily for protection of the person in surprise attacks with liquid vesicants.

b. Italian Army

(1) Gas Mask

The gas mask is always carried on the man.

(2) Personal Decontaminant

An "antivesicant packet" is carried by every soldier. It contains absorbent pads which are saturated with carbon tetrachloride from an ampoule which has to be broken. The contamination is then dabbed off with the moistened pad.

(3) Antigas Sheet

There has been no reference in any Italian manuals or orders to the existence of an antigas sheet, and none have been reported as having been captured. It is presumed that none have been introduced.

ENGINEERS

9. CONSTRUCTION OF SUBMERGED BRIDGE

The following description of the construction of a submerged bridge is a condensation of an article originally appearing in the Soviet "Red Star."

It was pointed out in this article that bridges built above the water are easily observed from the air and on aerial photographs, whereas bridges built below the surface of the water cannot be detected from altitudes greater than 900 feet and will not show up on aerial photographs.

Satisfactory conditions for use of submerged bridges are (1) that the enemy has not previously photographed the area of the crossing, or that the approaches to the crossing do not reveal the location -- either by the fact that existing roads are used or new ones constructed along the bank above and below crossing points; and (2) that there are no sharp changes in water level. It is sometimes more advisable to construct a submerged bridge within 2 kilometers of an already existing bridge above water. In such cases the enemy may bomb the latter, not knowing the submerged bridge is there.

The changes in water level cannot vary more than 10 inches. Any greater change will either cause the bridge to become impassable or be exposed.

The construction of submerged bridges is somewhat more complicated than the other types. Working under water increases the time necessary, and at times divers are needed; this requires special personnel, although well-trained troops can usually do the job without divers.

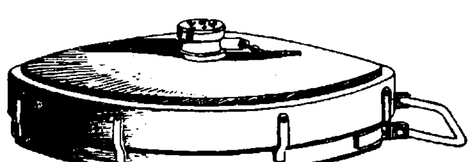
The actual construction of this type of bridge does not differ greatly from that of other bridges except perhaps in that prepared lumber is always necessary.

Care must be taken to have firm approaches; otherwise the disturbance of the water by crossing vehicles causes the approaches to wash away. This can be prevented, however, by constructing retaining walls and filling in with rock or gravel.

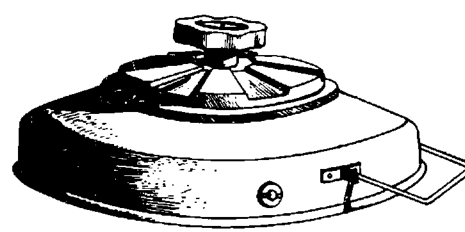
It is estimated that a 40-meter (130-foot) bridge with a 60-ton capacity requires 8 men 24 hours to prepare (but not drive in) the piles. Remarks: Our Military Attache in Moscow, commenting upon this type of construction, remarks as follows: "It was noted several days ago in the Soviet press that such bridges had been used by the Red Army, and in view of the recent creation of the medal 'Distinguished Pontoneer' it is possible that the use of such bridges has been successful."

10. GERMAN TELLERMINES

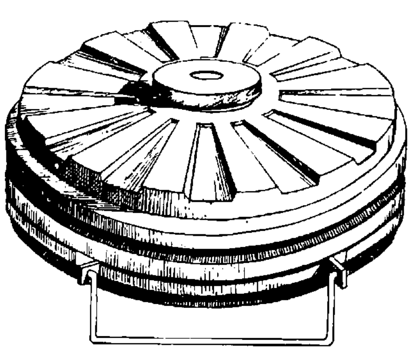
In the last issue of Tactical and Technical Trends (No. 28, p. 15), the four known German Tellermines (antitank mines), known as Tellermine Nos.



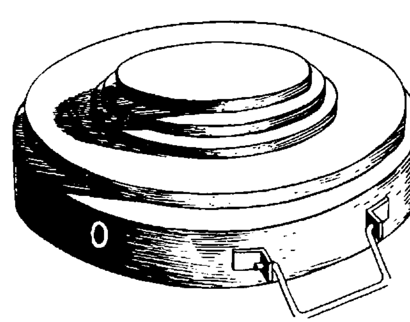
No. 1



No. 2



No. 3



No. 4

1, 2, 3, and 4, were described in some detail. An exterior view of Tellermine No. 4 is now available, and for purposes of comparison and identification the exterior views of all four mines are published herewith (see accompanying sketches). The mines are all of about the same dimensions, being approximately

12 inches in diameter and from 3 1/2 to 4 inches in over-all height. The relative scale of the 4 mines is only approximate in the sketches.

It should be noted that the pressure plates on Tellermine No. 1 and No. 3 extend over the entire top of the mines, but the pressure plates on Tellermines No. 2 and No. 4 cover only the center portion of the mine. Accordingly a tank might pass over the edge or rim of Tellermines No. 2 or No. 4 without detonating the mines, whereas the same load passing over the edge or rim of Tellermines No. 1 or No. 3 would detonate the mine. It is possible for a spread-out load of fairly low intensity covering the whole top of Tellermines No. 1 or No. 3 to detonate them, while a more heavy, concentrated load is necessary to detonate Tellermines No. 2 and No. 4.

The pressure plates on Tellermines No. 2 and No. 3 are fluted or grooved, but the pressure plates on Tellermines No. 1 and No. 4 are smooth.

INFANTRY

11. GERMAN DEFENSE OF LINES OF COMMUNICATION IN RUSSIA

An eye-witness recently returned from Russia gives the following information as to how the Germans protect their lines of communication. There are three lines of defense on either side of the road or railway to be defended, viz:

<u>The First Line</u>--This is situated approximately 10 miles from the road or railway and consists of wire with occasional machine-gun posts, and is only intended to give warning and delay infantry.

<u>The Second Line</u>--The defense areas in this line, which is about 2 miles behind the wire, are <u>dzots</u> or timber-reenforced, dug-in earthworks, containing heavy machine guns, mortars and light artillery and antitank guns. They are invariably arranged for all-around defense. These <u>dzots</u> are normally sited on road forks, cross roads, or in farm yards.

<u>The Third Line</u>--This, too, is based on <u>dzots</u> and is normally found about two miles from the road or railway to be protected. Here there are two or three rows of <u>dzots</u> centered on a village and inter-connected by shallow trenches. They are in radio or wire communication with each other and have, within the perimeter, artillery and a mobile force of light tanks and infantry, carrying automatic rifles. Tanks that have been knocked out are also dug in to turret level to form strongpoints.

Between the second and third lines, the terrain is mined and antitank obstacles are constructed. These, where possible, are covered by antitank guns.

<u>Comment</u>: Defense of lines of communication assumes added importance when it is realized that there is no well-defined line, in Russia, and parties from both sides operate as far as 20 miles behind each other's forward positions.

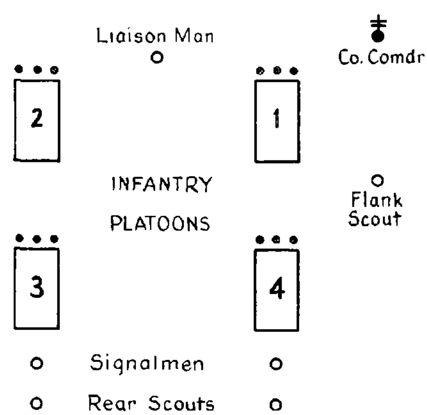
12. JAPANESE NOTES ON JUNGLE WARFARE

In planning their training for jungle warfare, the Japanese have been conscious of the great varieties of the jungle country of East Asia and the southwest Pacific area. The following points on jungle warfare taken from Japanese sources emphasize certain methods of jungle warfare apparently tested by Japanese experience.

* * *

a. The Advance

Leave some distance between the leading unit and the main body, and distribute liaison men between units; although it is best to relieve the unit each day, the officer commanding the leading unit should not be changed.



The above diagram reporduced from a Japanese diary had the caption, "Suggested Formation for a Company Advancing through Jungle."

It is essential for the leading unit to include in the regular reports to the commanding officer in the rear, the condition of the trail and the type of country.

As there are clearings in the jungle, the commanding officer must advance his units by bounds and rushes from one area to another. Camouflage of each man and each gun must be complete. When crossing a grassy plain, cover everything with grass. If enemy planes appear while you are in a clearing, lie still. Generally, riflemen must support the heavy weapons. The minimum is one rifle platoon for a machine-gun company and one for the battalion gun platoon.

When bivouacking in the jungle, cooking should be done in several places, well away from the bivouac area. All fires should be extinguished immediately after cooking. During the advance, communication will be by telephone and runner. Radio will not be used. The rate of advance will be regulated by that of the heavy weapons. The distance covered in a day will usually be between 3 to 5 miles.

b. The Attack

When selecting assembly areas for the attack, try to disperse units, and choose places which are naturally camouflaged. The concentration of the main force at the assembly point for the attack, must be made at night. If enemy artillery fire is encountered, it is important that this be neutralized before units take up their positions. Attacking units will move to the edge of the forest during darkness, crawling if necessary. On signal, they will rush the enemy positions. As it is best for each flank unit to make a rush at the same time, the time of the attack should be coordinated.

13. GERMAN VIEWS ON SNIPING

A German source reports the following notes dealing with snipers and the use of rifles with telescopic sights.

*   *   *

(1) Rifles with telescopic sights must be given to the best marksmen irrespective of rank. This should be looked upon as an honor, and changes should be avoided as far as possible;

(2) Continuous fire should be kept up when on the defensive in order to harass the enemy;

(3) During the attack the sniper should concentrate on the particularly dangerous targets and flanking movements. He should be situated some distance away from his squad and so be used for observation. Combination with mortar and rifle grenades is particularly effective, as the enemy can then be sniped at when he has been forced out from his cover.

When considering the telescopic sight it must be realized that the greater the magnification, the smaller the field of vision. A telescopic sight with wide field of vision and high magnification is not available for general service because of its size and its sensitivity. Further experiments in this respect are, however, being carried out. A telescopic sight of the sporting type is not suitable for military purposes and cannot be manufactured within a short period in sufficient quantities for issue in large numbers. The intention is to issue as many serviceable telescopic sights as possible, and not to develop just a few high-grade optical instruments.

The present telescopic sight has a low magnification but has been confirmed by experimental units as practical and rugged. When properly handled, it is effective in the field.

Sights must be tested before issue and, if necessary, corrected. This is nearly always the case when the sights have been transported for long periods.

For good results a fork rest is sometimes advisable. The range may have to be determined by using tracer; the actual sniping should be done from another position as the tracer will have given away the original position.

It is intended to issue one telescopic sight to each company and platoon HQ, and to each rifle squad. A special sniper's badge is under consideration.

Comment: This is evidence of increased German interest in sniping on a large scale. It is known that the Germans have been much impressed by Russian sniping methods.

14. GERMAN REARGUARD ACTION ON BRITISH EIGHTH ARMY FRONT

An example of the skillful maneuvers of the German rearguard action, on the British Eighth Army Front (January 1943) emphasizes the Germans' practical use of natural cover and natural tank obstacles.

The foundation of the German rearguard positions was always the 88-mm gun with 50-mm AT guns concentrated within the position. For support, reliance was placed on artillery (105's and 210's, and 75's on self-propelled mounts), tanks, engineers, and infantry well equipped with machine guns and mortars.

The German rearguard screen or protection in the initial stages (open desert) was at first deployed over a wide front. Artillery was here used (including the 88's) at extreme range to hold up the British advance and cause deployment. For this same purpose, mines were effectively used, including dummy minefields.

The Germans moved their tanks to engage the attention of British tanks and OPs while concentrating their antitank guns on the British line of advance, and then withdrew their tanks to hull-down positions.

No attempt was made to withdraw the antitank guns until dusk--in some cases after dark--when the German tanks invariably moved forward to cover their withdrawal.

Except in close country where natural cover and concealment afforded protection, the 50-mm guns were always placed in defiladed position.

A covered route of withdrawal was always provided for the antitank guns. Infantry were placed to protect the antitank guns against infantry attack; the protection was achieved by machine guns and mortar fire from the flanks and not by men in front of the guns.

The Germans made good use of both natural cover and natural tank obstacles in the siting of their guns; however, the damage inflicted was negligible, since it was preferred to hold up the British by firing at extreme range, rather than wait until there was certainty of making a "kill."

MEDICAL

15. SOME NOTES ON HEALTH PRECAUTIONS

Certain elementary precautions for use in tropical warfare are contained in the following notes taken from British sources.

*　　　　　*　　　　　*

Reports of the operations in New Guinea emphasize the necessity of a high standard of physical fitness; all troops must arrive in the area fit and hard. In order to maintain this high standard, close attention to unit and personal hygiene is at all times essential. In the jungle, troops often bivouac in small detachments, and it must be their personal responsibility to ensure that the precautions that they have been taught are faithfully observed. Strict adherence to malaria discipline is particularly important; otherwise, a force may suffer more casualties from malaria than through enemy action.

Clothing and boots are continually wet in the damp climate of most tropical countries, and full use must be made of every opportunity of drying them. In particular, boots should be removed at least once a day and the feet dried by vigorous rubbing. Neglect of this precaution may lead to personnel becoming ineffective through a form of trench foot. Arms and legs must be kept covered as protection against insects and infection from the undergrowth, and troops must be prepared to wear slacks instead of shorts in spite of the discomfort.

The provision of hot meals or hot drink is as important in the jungle as elsewhere, but when in close contact with the enemy, the necessity for concealment makes any form of cooking difficult. Troops should be capable of doing their own cooking, but experience has shown that supervision is necessary to ensure that mess equipment is properly cleaned after use in order to avoid dysentery.

Although what follows is not perhaps immediately related to this general subject, nevertheless it is not wholly out of place here. Many casualties have been caused among troops who have gone to the aid of wounded men during their advance. Troops must not be deflected from the operation in hand, and must realize that they will be of more assistance to the wounded by pushing on to their objectives and thus enabling medical personnel to come forward. The Japanese often fire along lanes in the jungle and, when possible, casualties should try to crawl to a flank where they can be aided in greater safety.

ORDNANCE

16. TWO GERMAN 100-MM SMOKE/HE MORTARS

In Tactical and Technical Trends, No. 24, p. 24 was published an account, based on the best sources then available, of a German 100-mm mortar. A more recent report indicates that there are not one, but two such weapons, and the original account was inaccurate in many details because of incomplete source data. More information on these mortars has now come in.

a. The 100-mm (4-inch) German Smoke Mortar (10-cm Nebelwerfer 35)

This mortar, the standard smoke-CW weapon of the German Army, is actually 105 mm in caliber. HE ammunition, however, is also fired, and the

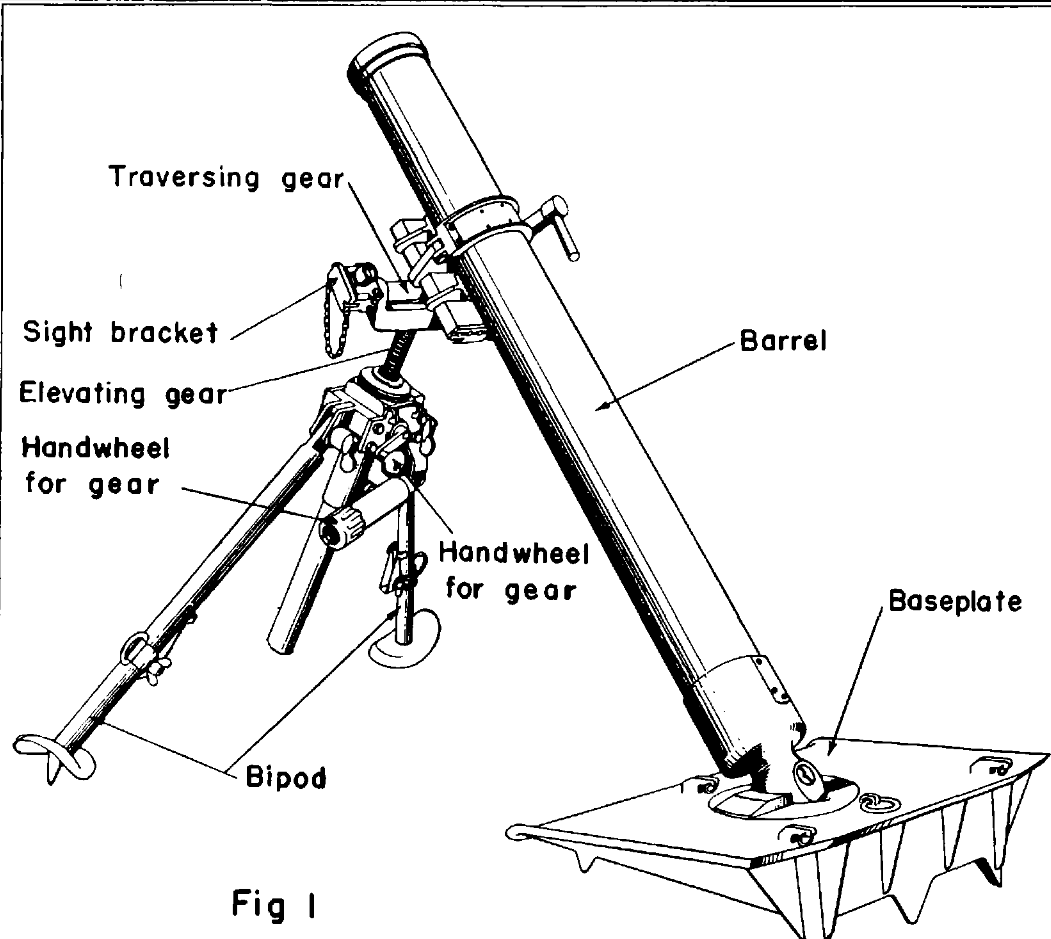


Fig I

mortar is used to some extent by airborne troops. It consists of a barrel, bipod, ᐧd baseplate constructed on the familiar German lines--a scaled-up version

of the German 81-mm mortar with the exception of the traversing gear. In this case, the traversing screw is housed in a sleeve by the two ends of a bow-shaped yoke, secured to the top of the elevating screw (see figure 1).

The particulars of the mortar follow:

Weight in action	231 lbs	Weight of bomb	16 lbs
Weight in barrel	72 lbs	Maximum range	3,300 yds
Weight of bipod	73 lbs	Rate of fire	12-15 rpm
Weight of baseplate	85 lbs	Crew	5 men

Transport, two-wheeled handcart

The details of the HE bomb are:

Weight	16 lbs	Color	greenish gray
Weight of filling	3 lbs 12 ozs	Length over-all	17.12 in
Filling	TNT	Maximum diameter	4.09 in
Fuze	Nose -percuss <u>Type</u> <u>WgrZ</u>*<u>38</u>	No of charges	primary plus four augmenting
Weight of primary charge	262 grains	Weight of augmenting charge, each	324 grains
Booster	Standard mortar bomb booster, type <u>Zdlg</u>**<u>c/98</u> <u>Np</u> with small smoke box	Packing	Singly in container; weight with bomb, about 20 pounds.

*Werfergranatzünder - mortar shell fuze
**Zündladung - detonation charge

<u>b</u>. <u>100-mm</u> <u>(4-inch)</u> <u>Smoke</u> <u>Mortar</u> <u>40</u> <u>(10-cm</u> <u>Nebelwerfer</u> <u>40)</u>

While full details are not yet at hand, it will be seen from figure 2 that the mortar is fired from a two-wheeled, rubber-tired carriage, provided with a rectangular baseplate. It is, in addition, known to be breech loading, an unusual feature in mortars, and has a rather long, smooth-bore barrel of 5.64 feet which presumably forced the adoption of breech loading. It would be interesting to learn how the breech mechanism operates.

Under the barrel will be noted in the illustration a tube that looks quite like a recoil mechanism, presumably to take up some of the stresses. The weapon throws a 19-pound bomb, either HE or smoke, from a 550-yard minimum, to the very respectable maximum range of 6,780 yards, nearly 4 miles, at a rate of from 8 to 10 rounds per minute. The elevation is from 44.8 to 84.6 degrees, and the traverse 7 degrees, right or left. Three charges can be used; charge I, 2.08 ounces, giving a muzzle velocity of 427 foot seconds; II, 4.76 ounces, 755 foot seconds, and III, with 8.78 ounces, which develops a velocity of 1,017 foot seconds. Altogether, this rather odd weapon presents a curious combination of a mobile, smooth-bore, gun-howitzer of considerable power on a light, handy mount, with extremely interesting tactical possibilities.

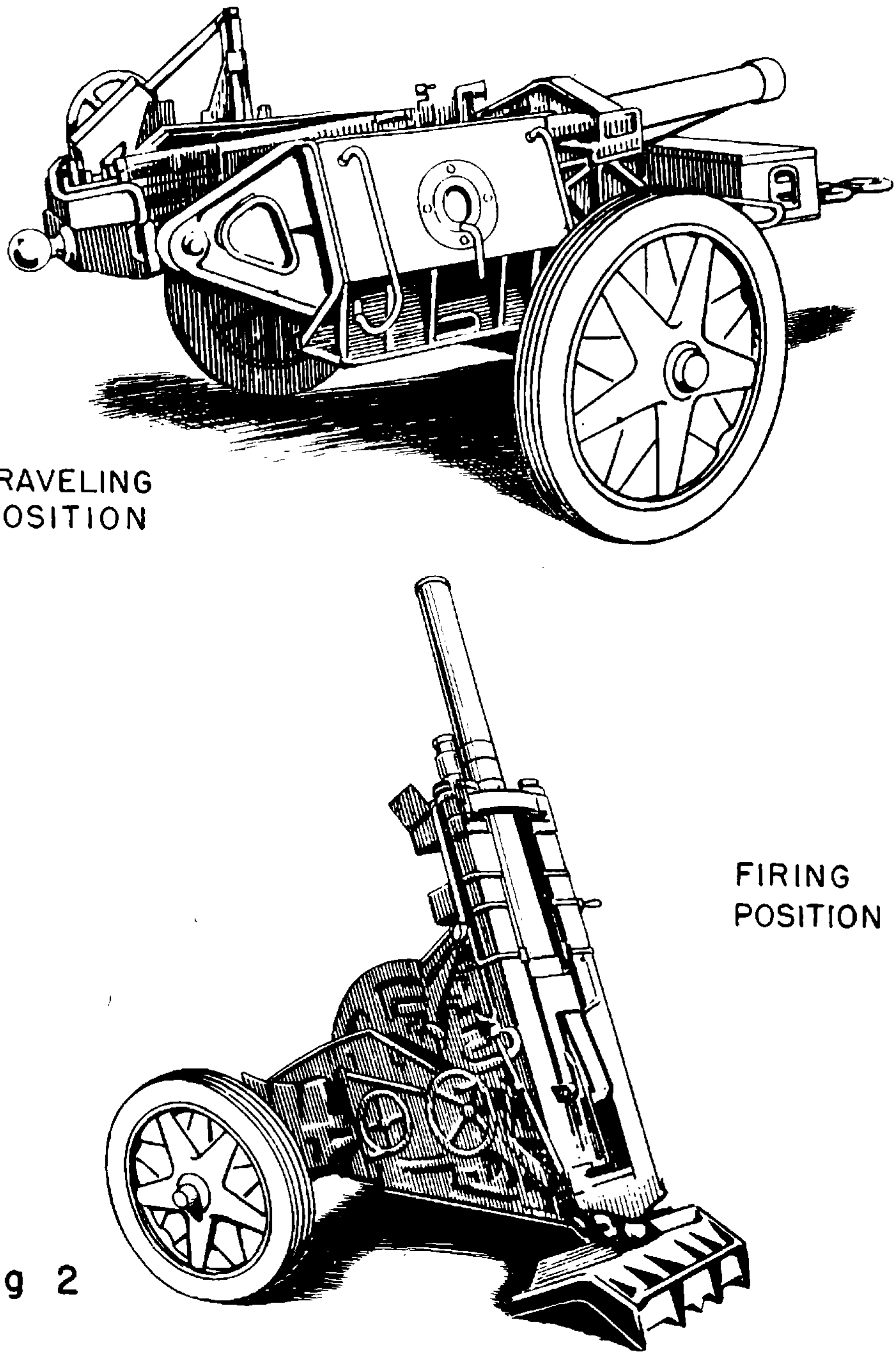


Fig 2

17. GERMAN N C 50 SMOKE BOMB

This bomb is designed to be dropped from aircraft. It is reported to produce large quantities of greenish-black smoke for about 20 minutes. An authoritative German military writer states that in cooperation with friendly ground forces, aircraft may drop smoke bombs to cover or screen hostile troops for a short time in limited areas. Presumably aerial smoke bombs would only be used for this purpose where, for one reason or another, more economical means than the airplane are either unsuitable or not available. Conceivably aerial smoke bombs might also be used to screen the dropping of parachute troops or to designate a target to bombers.

a. Description

This bomb is similar in appearance to the normal 50-kilogram (110-pound) HE bomb. The marking "N C 50" painted on the bomb is probably an abbreviation for "Nebel Cylinder 50 (kilograms)," that is "Smoke Cylinder 50 (kilograms)." The nose is painted white for 4 1/2 inches from the tip; from that point 4 white bands, 1 inch wide, run back to the shoulder where the nose is welded to the bomb body.

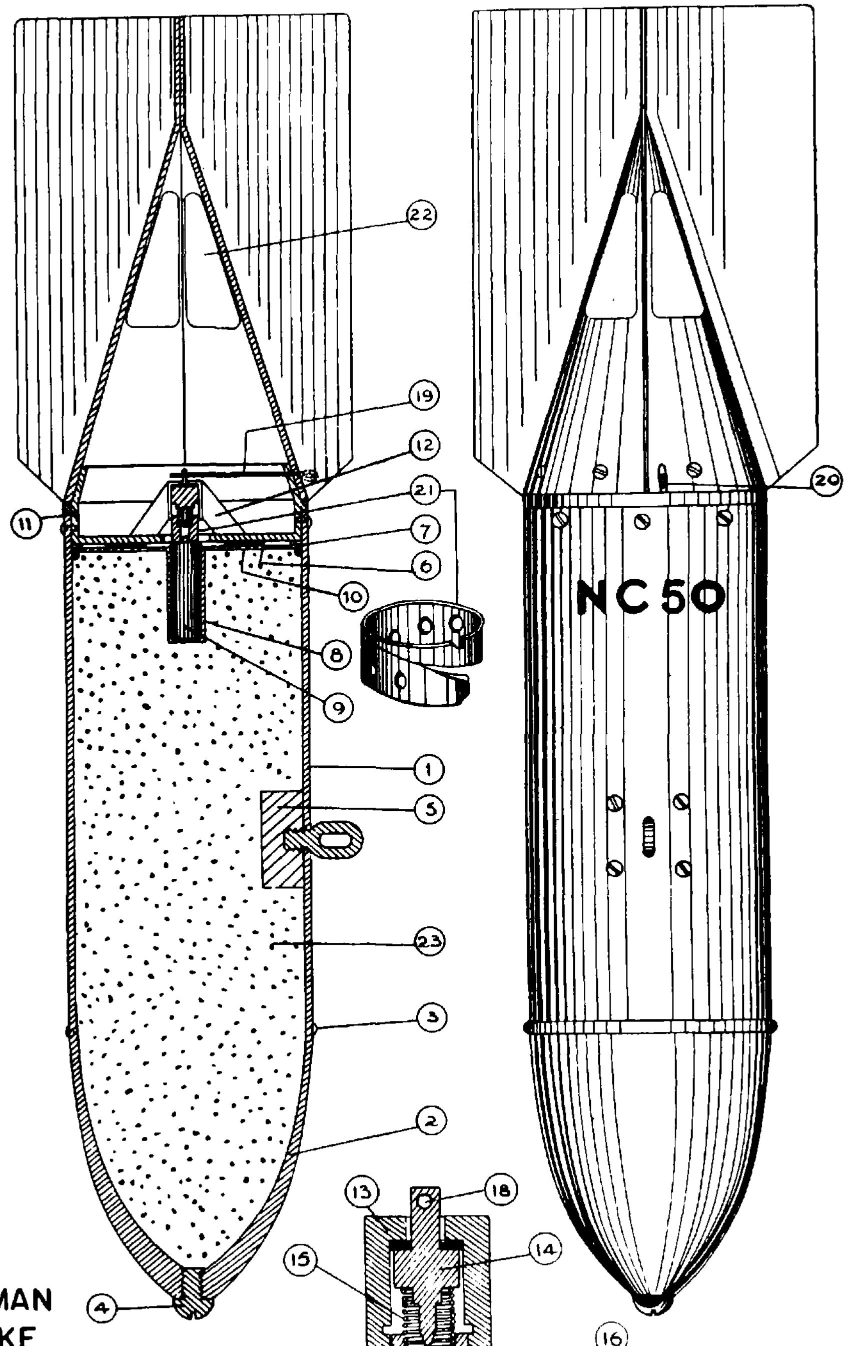
The over-all length of the bomb and tail is 3 feet 7.3 inches, the bomb itself being 2 feet 2.5 inches long with a diameter of 8 inches. The thickness of the casing is 1/8 inch. The smoke-producing filling consists of:

Hexachlorethane	91.1%
Aluminum powder	8.5%
Probably iron oxide and silica	0.4%

The bomb is made up in two parts (see accompanying sketch), the cylindrical portion (1) being welded to the nose (2) along the circumference at (3). In the nose is a screw plug (4) which can be removed to accommodate a lug for vertical suspension. The lug for horizontal suspension screws into a block (5) which is secured to the inside of the bomb casing. The closing plate (6) at the rear end of the bomb is made of sheet steel. The edge of this plate is pressed inwards, and then turned over so as to form a recess in which a rubber ring (7) is placed to seal the filling. To the plate is welded the igniter pocket (8) which contains the igniter (9). The latter consists of a steel tube 3 inches long and 1 inch in diameter. It is closed at its lower end by an aluminum disk, and at its upper end has an igniter cap pressed in.

The plate (6) has four equally spaced holes (10) which are covered by aluminum disks soldered in the position shown in the sketch.

Above the plate (6) and resting on it is the steel casting (11) which is secured to the bomb by eight screws. The base of this casting is perforated by 4 holes to correspond with those in the plate below it. At the center of the casting are 4 webs (12) supporting the fuze body (13).



GERMAN
SMOKE
BOMB NC 50

The fuze is simple in construction and consists of a striker (14) supported on a creep spring (15). Into the base of the body is screwed the cap holder (16). The cap (17) is housed in the recess in this holder and secured by burring over the top edge of the recess. The hole (18) takes the safety pin (19), which projects through a hole in the casting (11) and a slot (20) in the tail cone. Between the fuze and the igniter is a perforated coiled spacer (21).

The tail is similar in general appearance to that of a 50-kilogram HE bomb. It is made of sheet steel and is in 4 pieces. Each piece has a flat area to form the fin and a portion shaped to form the cone of the tail. The 4 pieces are welded together to form the complete tail. In the upper portion of the tail cone, 4 holes (22) are cut to provide suitable outlets for the smoke when the bomb functions. The tail is attached to the face of the casting (11) by 8 screws.

b. Functioning

On release of the bomb from the aircraft the safety pin (19) is withdrawn and the fuze is then armed. On impact the striker (14) compresses the creep spring below it and fires the cap (17). This in turn fires the igniter cap in the head of the igniter (9). This igniter contains a thermite mixture consisting of magnetic oxide of iron, magnesium, and aluminum powders. The weight of this mixture is 2.6 ounces.

The thermite on ignition melts the solder on the disks (10) and provides an exit for the smoke. The main filling is ignited when the aluminum closing disk in the base of the igniter burns through.

c. To Render Safe

If the safety pin (19) is not in place, the bomb may be rendered safe by first unscrewing the 8 screws securing the tail to the bomb, and removing the tail; a cotter pin or nail should then be inserted into the hole (18) and in the striker (14). If the safety pin is not in place, jolting the bomb before rendering it safe may cause it to function.

18. INCH EQUIVALENTS OF MILLIMETER MEASUREMENTS

In reading European specifications expressed in metric terms, Americans often have difficulty in translating them into English equivalents. The following table may be helpful:

MM	Inch	MM	Inch
1	.039	19	.758
2	.079	20	.787
3	.118	25	.984
4	.157	30	1.181
5	.197	35	1.378
6	.236	40	1.575
7	.276	45	1.772
8	.315	50	1.969
9	.354	55	2.165
10	.394	60	2.362
11	.433	65	2.559
12	.472	70	2.756
13	.512	75	2.953
14	.551	80	3.150
15	.591	85	3.346
16	.630	90	3.543
17	.669	95	3.740
18	.709	100	3.937
		105	4.134

Approximate armor thickness usually met with on German Tanks:

MM	Inch	MM	Inch
5	.20	22	.87
10	.39	26	1.02
12	.47	30	1.18
14	.55	50	1.97
15	.59	62	2.44
18	.71	82	3.23
20	.79	102	4.02

Land-gun calibers--(G) for German, (J) for Japanese, (I) for Italian, (F) for French (captured), and (R) for Russian (captured). Designations of countries not necessarily exclusive.

MM		Inch
6.5	(I-J)	.256
7.5	(F)	.295
7.62	(R)	.300
7.7	(J-I)	.303
7.92	(G)	.312
8.0	(J-I-F)	.315
9.0	(G-I)	.354
12.7	(I-J)	.500
13	(J)	.512
15	(G)	.591
20	(G-I-J)	.787
25	(F)	.984
28	(G)	1.102
30	(G)	1.181
37	(G-J-I)	1.457
46	(G)	1.811
47	(I)	1.850
50	(G-J-R)	1.969
70	(J)	2.756
75	(F-G-I)	2.953

MM		Inch
76.2	(R)	3.000
81	(G-J-F)	3.189
88	(G)	3.465
100	(G)	3.937
105	(G-J)	4.134
122	(R)	4.799
150	(G)	5.906
152	(R)	5.985
155	(F-J)	6.102
170	(G)	6.693
200	(J)	7.874
203	(R)	7.992
210	(G)	8.268
240	(G-J)	9.449
280	(G-R)	11.024
300	(G)	11.811
305	(G)	12.007
350	(G)	13.779
380	(G)	14.961
610	(G)	24.016

NOTE: According to the metric system, the meter is split up into tenths, hundredths, thousandths. Latin prefixes are used:

deci	=	1/100
centi	=	1/100
milli	=	1/1000

For larger measures, Greek prefixes are used:

Deka	=	10
Hecto		100
Kilo	=	1000

Thus we have the following measurement basis:

10 millimeters (mm)	=	1 centimeter (cm)
10 cm	=	1 decimeter (dm)
10 dm	=	1 meter (m)
10 m	=	1 Dekameter (Dm)
10 Dm	=	1 Hectometer (Hm)
10 Hm	=	1 Kilometer (Km)
1 inch	=	2.5 cm (approx)
5 miles	=	8 Km
1 Km	=	.621 mile (approx 5/8)

19. SECURITY IN THE BRITISH INDIAN ARMY

The following instructions in military security come from British sources and are intended for the guidance of the "Unit Security Officer" of the British forces operating in India. Especially charged with the problems of security are the "Field Security Sections" and the "Unit Security Officers," discussed below.

* * *

a. General

Security is the name given to our countermeasures against the enemy's secret attack by espionage, sabotage, propaganda, and Fifth Column activities. The enemy espionage service is trying to obtain information about all military matters. Enemy saboteurs are holding up our war effort by damaging war materials, derailing trains, and tampering with gasoline supplies. The enemy propaganda aims at undermining morale.

Security measures will neutralize such attempts. Security is only possible if it becomes the personal daily concern of every member of the forces, from the Commander-in-Chief to the private, and of every civilian.

b. Field Security Sections

In all activated corps and divisions there are Field Security Sections on the scale of one per corps and one per division, and such sections as the situation demands at Army Corps HQ, GHQ, on lines of communication, base areas and ports. Part of the personnel are linguists, and all are specially trained in security work.

(1) Composition

There are three types of sections, all-Indian, composite (Indian and British) and all-British. [The all-British would probably be met with an all-British division, and a composite or all-Indian in the Indian divisions or special organizations.] The all-Indian sections consist of a lieutenant [probably native], two "Viceroy's commissioned officers" [corresponding to our warrant officer, and of two grades], two sergeants, four corporals, six lance-corporals, and two privates. The composite sections consist of a lieutenant, one warrant officer, a sergeant, two corporals, two lance-corporals, all British; a native sergeant, two native corporals, two native lance-corporals and a native private. The all-British sections include one officer--captain or lieutenant, two warrant officers, two sergeants, four corporals, six lance-corporals, and a private. In each of the above groups, the privates are orderlies or chauffers. All sections have a 1 1/2-ton truck and are completely mobile and self-contained.

(2) Duties

The duties of the Field Security Section are to advise and instruct in all

security matters, to provide specialists for putting security measures into operation and to conduct security investigations, and to cooperate with civil police in counter-espionage. The sections work under the direction of the Intelligence Staffs of the units to which they are attached.

Field Security personnel are not concerned with the discipline of troops. They are concerned with the maintenance of good security. All ranks should be encouraged to look on them as friends and advisers, whose criticism, when made, is intended to be constructive only. They are NOT police or spies. There are at ports, in addition, specialized Security Sections who work under the local Military Port Security Officer. These are directed by Military Intelligence Directorate of GHQ and are mainly concerned with counter-espionage control. NOTE: All-British Field Security Sections raised and trained in the United Kingdom are part of the Intelligence Corps.

When the Indian Intelligence Corps becomes fully organized, all Field Service personnel will be accordingly transferred to it. Members of Field Security Sections raised and trained in India are mainly drawn from the units to which they will eventually be assigned.

c. Unit Security Officers

In every unit or installation, one officer will be appointed as "unit security officer." His duties, as such, are in addition to his other duties. His role is an important one for he is charged with the training of the individual, which is the foundation of good security.

It is his duty to ensure that security measures are properly applied within his own unit. His responsibility as far as concerns civilians, other than those employed in his own unit, is limited to close liaison with the civil authorities. He will also act as an intelligent observer and reliable reporter of suspicious incidents.

He must at all times maintain close relations with the Field Security Personnel in his unit or area. He must now, however, carry out any investigation work except under express instruction from the higher command. It is possible that this particular case is already under investigation, and that independent investigation will only cause confusion.

d. Military Security

(1) Security of Information

Surprise is a most potent factor in war. It is of supreme importance that we deny the enemy information from which he may judge of our condition or guess our intentions.

This can be done by using common sense and imagination to prevent military information of any kind coming to the knowledge of unauthorized persons

and so, eventually, to the enemy. It is the rule of the closed office and the closed mouth--in a word, security discipline.

Every soldier should be made to understand that a breach of security is not merely an offense against an arbitrary military code, but a crime against his comrades and his country's life.

The knowledge of an enemy's armed forces, dispositions, and intentions is usually gained by the piecing together of many disjointed and often apparently quite valueless scraps of information. No piece of information can, therefore, be regarded so trivial as not to require safeguarding.

Information which is of particular interest to the enemy includes the following:

Our intentions and plans for the conduct of the war by land, sea and air.

Means whereby any enemy operations have been frustrated.

The order of battle, movements, locations, and morale of our forces. The names, characteristics, and particulars of our commanders and their staffs.

Developments in all forms of armament, equipment, and training.

Administrative arrangements, such as locations of bases, supply depots, distribution centers, and key industrial plants. Details regarding sources and systems of supply of all kinds.

Any reference to spies or suspicious persons in our hands, whether awaiting trial or already disposed of.

Sailing dates, routes, and destinations of all types of shipping.

Losses in men and materiel.

Details of enemy attacks, whether by sea or air.

The situation in regard to manpower, recruiting, economic resources, and civilian morale.

Local subversive political movements.

Our information regarding the enemy.

The main sources of leakage of information may be summarized as:

Insufficient precautions to prevent unauthorized persons from obtaining access to offices, HQ and other military establishments. All persons, whether in

uniform or not, and of whatever rank, must be made to establish their identity unless personally known to the guard. Over-caution is excusable, lack of caution is criminal.

Carelessness in classification and safeguarding of documents, marked maps, ciphers, codes, etc. Omission to burn drafts, carbons, unnecessary copies of orders, etc. Omission to carry out a systematic search of all vacated premises, including officers' quarters, when moving. Omission to collect daily and burn under supervision all secret waste paper. Carelessness in carrying secret documents on the person in trains or in cars at all times and particularly when in contact with the enemy. Disclosure of the existence of secret documents. Even laundry tickets and theater stubs or old letters may sometimes give valuable information to the enemy.

Disclosing official information of future operations, moves, etc., to anyone not directly concerned with such information.

Capture by the enemy, and loss, of personal diaries. All personnel must realize that these are documents which are certain to contain matters of interest to the enemy, and must be safeguarded.

A fruitful source of information to an enemy intelligence staff is the examination of our prisoners of war. All personnel must, therefore, be thoroughly instructed as to their conduct if they have the misfortune to be captured. A prisoner must give his correct name, rank, and serial number and nothing else. The most difficult man to interrogate is the one who is determined to maintain a polite but strictly military attitude towards the interrogator, viz., "You are a soldier. I am a soldier. I have my orders and I must obey them."

Reticence under interrogation must be followed by reticence among fellow prisoners; it is certain that there will be "stool pigeons" dressed in British and Indian uniforms to overhear conversation. Microphones may also be used. It is absolutely forbidden for prisoners to broadcast. Unless incapacitated by wounds, it is the duty of a soldier taken prisoner to attempt to escape. The first 24 hours after capture usually present the most favorable opportunities.

(2) <u>Security of Materiel</u>

As far as military security is concerned, this is mainly a question of providing physical safeguards, and of siting dumps, vehicle parks, etc.,with an eye to protection against sabotage. The dispersal of dumped materiel into small lots to limit the effects of enemy air attack frequently makes physical safeguarding difficult, but such dispersal also localizes the effects of an act of sabotage. The only time at which a potential saboteur is likely to come into the open is when he is making his reconnaissance. For this reason the strictest security of identity papers, both of civilians and members of the uniformed services, is absolutely necessary wherever antisabotage guards are mounted. No person of whatever rank should be allowed to approach the materiel or the point being guarded unless it is necessary for him to do so in the course of his duty and then only after identifica-

tion. It is also the duty of Unit Security Officers to advise, on track discipline, vehicle concealment and camouflage affecting safety from air observation and attack.

(3) Security of Personnel

Lying propaganda, rumors, doubt and treason are weeds that flourish in rank soil, but cannot take root in a healthy one. The cultivation of resolute cheerfulness, sane thinking, and high morale is an invincible defense. Rumor must be traced and the persons who start and pass on rumor must be punished. Listening to enemy radio propaganda should be ridiculed and discouraged. It should be impressed upon all ranks that it is their duty at all times to discourage and counteract unfounded gossip or statements likely to cause alarm or despondency, whether made by members of the armed forces or civilians, in public or in private. Security officers are reminded that troops going on leave and off duty are their best propagandists if properly trained and instructed.

(4) Security of Operations and Training

This is the particular application of all security measures to ensure the secrecy of particular operations or training. These are frequently coupled with active measures to deceive and mislead the enemy which are usually the subject of special instructions from the higher command. The responsibility of unit security officers is to see that these are carried out to the smallest detail.

SECTION II

UNDERGROUND MINING OPERATIONS IN WARFARE

UNDERGROUND MINING OPERATIONS IN WARFARE

Mining operations--not to be confused with the laying of ground mines--are a rather unusual but at times a vitally important phase of warfare, which may be called for when the "Fortress of Europe" is invaded. Its origin is ancient. In Roman days, if not earlier, mines were dug under city walls, and the props that held up the walls during the digging operations were then burned out, causing sections of the wall to collapse. In the First World War, mine warfare was carried on extensively in Flanders, culminating in actions at Messines and Wytschaete Ridges, where on 7 June 1917, the British troops, in preparation for their offensive of June 1917, blew out the large German position together with much of the crests of the ridges. On 13 March 1918, the greatest single blast in military history was effected by Austrian mining engineers against the Italian position on Mt. Pasubio, on the Adige about 40 miles north of Verona. It blew off the whole top of the mountain and turned it into something very like a volcano in full eruption.

The following pages have been selected from an article in the Pioneers' Quarterly (Vierteljahreshefte für Pioniere). Its author is reported to be a former engineer officer of the Austro-Hungarian Army and "one of the most experienced men in mine warfare." The article is dated May 1939.

a. The Surface Effects of a Mine

(1) General Considerations

Mine warfare is a part of tactics on the combat front; it differs from other tactical methods in the place of combat, underground, and therefore the method of conducting the combat is different. The proper weapon in mine combat is the mine, that is, the concentrated explosive charge completely enclosed in the earth.

The range of effect of this weapon is limited; 10 meters' range requires as much as 4,400 to 6,600 pounds of modern explosives, while a range of 20 meters requires as much as one and a half to two carloads.

The mine attack is for the purpose of destroying both personnel and materiel of the enemy by its effect at the surface. The operations that follow the blast are not our concern. For the mining engineer officer, the decisive element is the mine crater itself.

(2) Craters

(a) Craters in Earth

By the effect of a single explosive charge sunk in the earth, the mass of earth lying above it is thrown out (see Fig. 1). In figure 1, M--M 1 is the sur-

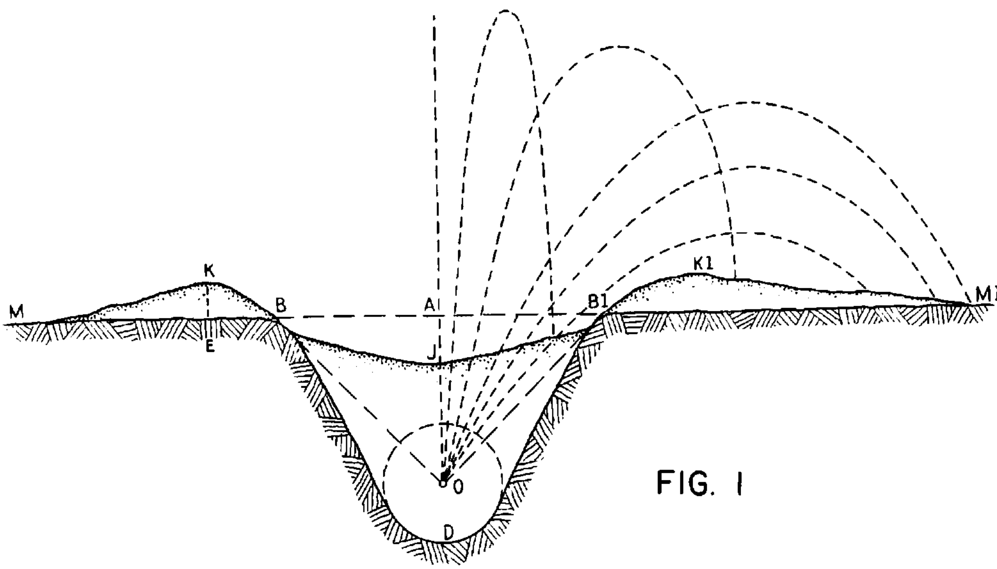


FIG. I

face of the earth; B and B 1, the edge of the crater; B--D--B 1, the crater initially blasted; and B--J--B 1 the crater actually resulting. The crater radius is B--A or A--B 1. K and K 1 are the crater crown, A--J the depth, and A--O the depth of the charge to the center of the charge (O), which is the shortest line of resistance. The dislodged earth-core can only be a cone, and in its place there remains in the earth a crater of equivalent size. This cone of earth is hurled vertically by the explosive charge and breaks up in the air; then almost all of it falls back into the crater. For an excellent illustration of a typical blast, see figure 2. The crater is refilled in large part to approximately two thirds of its depth, while the remainder of the erupted earth drops within a short radius on the edges of the crater and forms the crater crown. A small portion of the earth in the air, the "crater cone," is more widely scattered, and is called the "crater spread."

The magnitude of the crater effect can quite generally, as a rule of thumb, be determined by the following method:

The radius of the presumed circular crater cavity is normally equal to the depth at which the charge was placed. Whenever, therefore, the charge lies at a depth of 33 feet,* then the crater diameter is also 33 feet and the diameter

*All data are translations of metric terms except as stated otherwise.

of the crater cavity 65 feet. (This would be the effect of a charge of about 4,400 to 6,600 pounds of demolition explosive.) The ultimate crater depth is, as mentioned, one-third of this magnitude; with a crater radius of 33 feet, therefore, a crater depth of 9 to 10 feet measured from the surface of the earth. The height of the crater crown is fixed at about one-third of the crater depth; in our example, accordingly, 3 to 4 feet.

Figure 2 illustrates the beehive shape of the "crater cone" or earth hurled up by the blast of a standard mine containing 771 pounds of HE in alluvial gravel. At the top of the cone, corresponding to the cubical shape of the charge, extend the 4 "peaks." The cones of overcharged mines open at the top in a form of a bouquet, while weakly charged mines produce cones ranging in appearance from a cake down to a simple oval skullcap. In this way, from the shape of the "crater cone" alone, conclusions can be drawn as to the strength of the charge, the type of mine, and even the ground conditions. The crater cone of dispersion, that is, the height to which the earth is propelled, is usually twice the depth of charge. With a charge depth of 33 feet, therefore, the crater cone would rise to 66 feet.

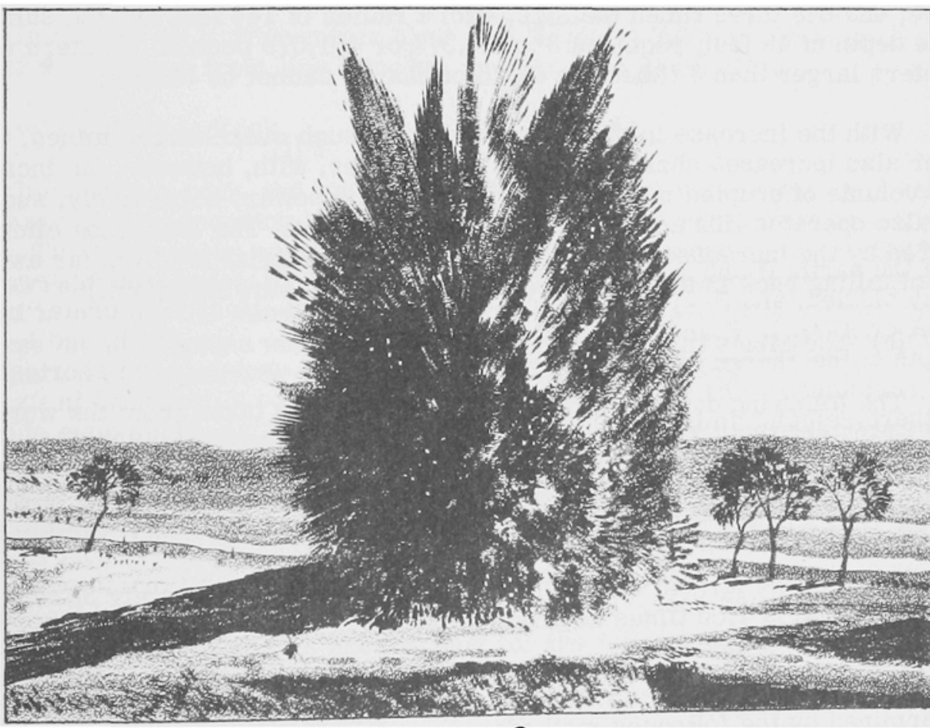


FIG. 2

The crater scatter usually reaches the same dimensions as the crater cone. The limits of the crater scatter are difficult to determine conclusively. A lethal effect outside the area stated, however, is not to be assumed in any case. Occasional accidents due to stones, etc., cannot be given any consideration as risks in war. Precaution should be practiced however; in peacetime training maintain a cleared zone of 1,000 feet on all sides.

The crater, plus the scatter, represents the actual zone of destruction on the earth's surface; in our example, therefore, with 66 feet of scatter plus 66 feet of crater plus 66 feet of scatter, we have a total of 198 feet. This--and here is the point to emphasize--is the absolute limit of the external effect. Within such a zone living men as well as the material will be destroyed or buried. Outside these limits the mine has almost no real effect.

Naturally, the attacker will apply himself to the accomplishment of this final result of his exertions and combat by making the external destruction as comprehensive as possible. To a certain degree, this can be achieved by heavier charging of the mine--overcharging. However, overcharging involves a serious disadvantage,--an enormous increase in consumption of explosive. Today this has even greater weight, since mine galleries, because of the effect of artillery, must lie at least 39 feet and if possible even deeper, below the earth's surface. The size of the charge, however, increases as the cube of the crater radius. If a crater 49 feet in radius with a charge depth of 49 feet requires about 14,887 pounds of ammunition, a crater twice the size, with a radius of 98 feet and the same depth of charge, requires 2^3 x 14,887, or 119,016 pounds of demolition explosive; and one three times the size, with a radius of 144 feet and the same charge depth of 49 feet, requires 3^3 x 14,877, or 401,679 pounds. Craters with diameters larger than 3 times the depth of charge cannot be blasted.

With the increase in the crater radius of such overcharged mines, the scatter also increases sharply--by the third power, with, however, an increase in the volume of erupted matter by only the second power; accordingly, such a mine also operates like an ordinary land mine. (Note: The land-mine effect is produced by the increased scatter, as the erupted material is blown far away instead of falling back in the vicinity of the crater with burying effect.)

(b) The Mines in the Wytschaete Bend

The following data relating to mine craters was taken from the work by Major Kranz entitled "Mine Combat and Military Geology in the Wytschaete Bend" (Minierkampf und Kriegsgeologie im Wytschaetebogen) appearing in No. 3 (1935) of The Pioneer Quarterly. At Wytschaete and Messines Ridges on 7 June 1917, the British set off 19 mines in the watery clay of the Flanders flat-lands.

Some of the largest craters, with a charge of approximately 35 tons of ammonal, which is 1.05 times as powerful as TNT, at a charge depth of 97.8 feet had the following dimensions:

Diameter	265 ft
Width of crater crown	60 ft
Height of crater crown	17 ft
Depth of crater	51 ft

The largest single charge used by the British in the Wytschaete Bend amounted to 95,573 pounds of ammonal, which with a charge depth of 125 feet

produced a crater of 165 feet in diameter and 17 feet in depth.

If we average the 19 mines used on 7 June 1917 in the Wytschaete Bend, all of them gigantic mines with a total outlay of 913,315 pounds of demolition explosives, we obtain:

Crater diameter	182 ft
Width of crater crown	62.5 ft
Depth of crater	26 ft

Let us assume that each mine is placed in the most unfavorable position for the defender, i.e., perpendicularly below the combat position.* We then see that the position under attack is disturbed by one mine for a width running across the entire crater and the two outside crater crowns, that is 182 + (2 x 62.5), or 307 feet, and in the depth of the position by the half crater + one crater crown, that is 91 + 62.5, or 153.5 feet.

This is the absolute total effect of one such mine on the earth's surface.

In all, the 19 British mines blew up a length of 2,000 yards in the 10.6 miles of the German front line attacked, or about one-tenth of it.

(c) Craters in Rock

In mountain rock, the mine effect is fundamentally the same as in soil. The charges, corresponding to the greater resistance of rock, must be made larger. The form of the surface effect is strongly influenced by the conformation of the terrain; this must, of course, be given due consideration in the plan of attack and in placing the mine. Here too, in fact, we also see quite regular craters, like those on Mt. Cimone and the Col di Lana where the flat and almost uniform conformation of the surface of impact permitted such a result.

On the other hand, however, we note mines with quite peculiar external effects, sometimes intended, sometimes unintended. Such, for example, was the case of Mt. Pasubio, where by the blasting of two lateral craters, the rock mass supporting the enemy emplacement was brought to collapse (see Figs. 3 & 3a)-

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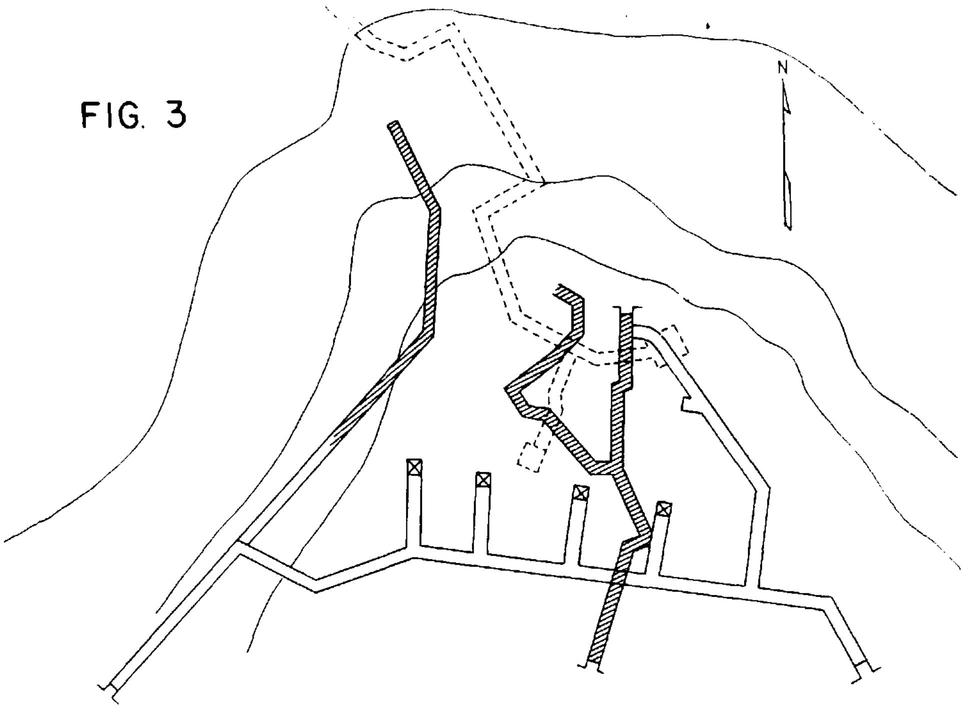
*In practice, however, this is not frequent for the following reasons:

1. The attacker, in using the mine, will try to demolish the obstacle placed in front of the position.
2. The long work directly below the feet of the enemy is in no sense a comfortable matter. The placing of the mine itself (construction of the mine chamber, charging, attaching fuse connections, and tamping with truckloads of sand bags, concrete and steel, or wooden beams) takes a week or even longer. For this reason one is satisfied in most cases to have the blasting effect merely reach the enemy position.

Both sketches are schematic only and not to scale. Figure 3 is the plan for the final blast on 18 March 1918, and 3 a, the approximate position of the Italian and Austrian mine galleries. It would appear that the Austrian galleries were driven below those of the Italians.

FIG. 3



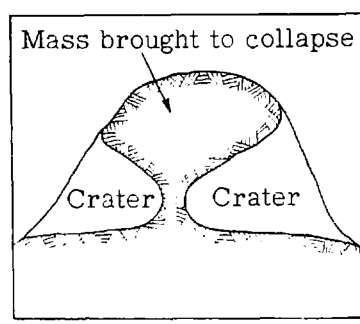


FIG. 3A

b. The Subterranean Effect of the Mine

(1) General

The effect of the explosive with which the mine is charged, on its explosion

is an impact generated in a fraction of a second. This impact operates with equal force in all directions, therefore in a spherical form. This is the start of the effect of every mine, quite independent of how this effect is later transmitted.

The impact is propagated in the earth, so long as it has sufficient force

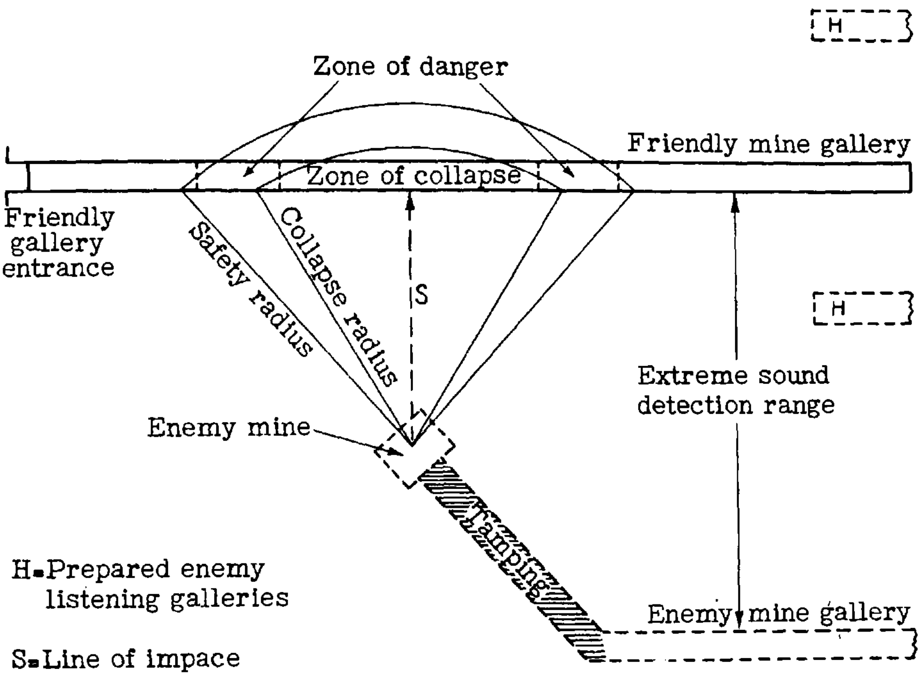


FIG. 4

to overcome the quite considerable resistance of the soil and rock. It is finally dissipated if the mine lies deep enough in the earth, or reaches a point somewhere at which the resistance is weaker and gives way completely. The impact then behaves as a thrust and hurls the portion of the earth which still offers resistance into the air; the mine comes into the open and produces the crater.

(2) The Camouflet, or Completely Subterranean Mine

In the first case of the dissipation of the wave of concussion, there can be only a subterranean effect, and the mine therefore acts only underground; it is then called a "camouflet" (figs. 4 & 5), a crushing or damped mine. It is easy to see that the camouflet can utilize in subterranean effect the force it economizes in comparison with the crater mine.

A distinction is therefore n le between the crater mine with both surface (external) and underground effect, and the camouflet with a somewhat greater

destructive effect, but entirely underground.

The officer in charge should recognize that the crater mines primarily of interest to him have not only a surface effect due to excavation of crater, lateral burying effect, and scatter, but have their subterranean effect as well against one's own dugouts, shelters, etc., below the earth's surface. This underground effect reaches approximately the same magnitude as the surface effect, but in a spherical form in all directions around the mine.

One more point should also be mentioned here: that the camouflet is of primary interest to the miner for his own combat. This form of mine is his weapon, in fact his weapon exclusively. The crater mine is only the final objective of his work. Until he reaches this objective, in the course of mine combat he will have to apply many camouflets, for it is with them that miners fight in subterranean combat, defenders work to ward off the subterranean enemy, and the attacker strives to cut his way through the subterranean defense installations. To make use of the crater mine before reaching the final objective is always an error on the part of the defender, and is an error in most cases on the part of the attacker, if either does not by so doing promote some other major purpose.

(3) The Gas Effect of the Mine

We know that the explosive effect occurs as the result of the transformation of the explosive into a tremendous volume of gas under intense pressure and at a high temperature, with the volume and quantity of gas persisting for some time after the blasting. These effects then are dissipated in the vicinity of the mine with cooling of the gases and loss of pressure.

FIG. 5

These gases, or more properly, this gas composite, are a compound of various gases and vapors, of which carbon monoxide only, because of its dangerous properties and the quantity that is produced in blasting, is of interest to our discussion. Carbon monoxide is colorless and extremely poisonous. There is no warning of it. Inhaled in even slight quantities, it has a fatal effect. Mixed with atmospheric air, it burns, and with a certain ratio of mixture it becomes highly explosive. The gas masks used in the last war

provided no protection whatever against it, and only the inhalator equipment generating breathable air itself could give protection against the poisonous effect.

This gas production, a secondary result of the mine, can often become the major consequence. It is equally dangerous for friend and foe. Frequently, along with the poisonous effect, the entire volume of gas will ignite, produce explosions in various places, and, by setting fire to structural material or stores, cause stubborn fires in the emplacements. Some examples from the history of war will explain and illustrate the point; while from earlier wars many examples are on record of serious catastrophes due to the gas effects of mines, we shall confine ourselves to those from the last war. In the Italian mine blasting on the Castelletto, the blast gases made the mine galleries, which had to be designed to serve tactical purposes as well, unusable for 2 days after the shot. The attack-column, dashing forward from the gallery immediately after the blast, was overcome immediately by the gas and suffered extremely heavy losses in gassed and dead. We read in the descriptions of the mines in the Wytschaete Bend on 7 June 1917 of the blazing sea of blue flames in the bottom of the gigantic craters. On the Lagazuoi in the Dolomites in 1917, a persistent fire was reported in the craters produced by the Austro-Hungarian blasting of 22 May which made any approach to the crater impossible because of the heat it generated. Finally, on Mt. Pasubio, as a result of the peculiarity of the mountain structure, the gas effect played a part in each of the 11 blastings done in the course of the mine combat and led to serious losses among the Austro-Hungarian troops. Thus, on 2 October 1917, when Austro-Hungarian miner and assault patrols hurried into the quite open and absolutely undamaged galleries following the Italian blasting, they suddenly dropped as if struck by lightning. In the final Austro-Hungarian blast on 13 March 1918, absolutely the greatest blasting of military history, the entire mass of Mt. Pasubio was enveloped in flames, and jets shot out from the Italian gallery exits for a distance of 100 feet during a period of hours.

This phenomenon in mine combat, which results in far greater casualties than the purely mechanical effect of the mine, should be given much more attention than was given it in the war of 1914-1918.

c. <u>The Mine in Combat against Modern Fixed Fortifications</u>

For obvious reasons, within the scope of this article we shall attempt to speak only quite generally on the topic of mine combat against fixed fortifications. Here the important point is the absolutely static position of one party, the defender. From this fact arises all the peculiarities of the situation from the operational, tactical, and also the mining viewpoints. The battle for fixed fortifications must be fought out on the spot. While in field warfare a local withdrawal from the vicinity of a known mine can usually be made without great tactical loss, such a retreat often can not be made from a fortified position without endangering the whole front. The possibility of underground combat against such fortifications must be regarded as ever present.

Because the forward area of permanent fortifications is prepared and completely dominated by the defender, greater underground distances will also have to be overcome at the start of the attacker's subterranean activity. In attack on permanent fortifications the opportunity for a short mine combat with a surprise effect on the enemy will scarcely ever arise. A second determining factor in the situation stems from the consideration that the attacker will always meet an enemy prepared for underground warfare. The attacking miner is faced with a difficult battle with an enemy who has reconnoitered the details of a possible mine attack in advance, on the basis of his defensive system built up in time of peace. He now lies in wait like a spider in this thoroughly planned system and can operate effectively against the attacker everywhere and almost without danger to himself. The attacker will have to consider giving the underground attack a more prompt and systematic development by increased provision of personnel and equipment. For this reason numerous organizations capable of conducting such work will have to be in readiness, and in addition, units trained in mine combat and organized solely for this purpose, as well as columns and stores of machines, tools,and material.

From the standpoint of mine tactics, the attacker has the advantage that he is subject to only the one limitation--that in any case, the attack objective must be reached. The final objective of the underground attack against fixed fortifications is never, or only rarely, the mine effect on the earth's surface, but rather the fortified installations of the enemy, positions that cannot be reached by artillery fire, such as the substructures of gun and machine-gun turrets. The matter is therefore one of purely demolition mines, quite similar in placement to the crater mine, with their depth depending upon the effect to be obtained against those targets.

d. Underground Combat

(1) General

Without a knowledge of its tactical method of employment,it is impossible to understand the use of any weapon. The following sections will outline, principles which every commander should know on the subject of underground combat. These suggestions are not intended to be a complete guide to independent leadership of underground warfare, but rather an explanation of methods which should be generally understood by members of the land forces.

(2) Reconnaissance

The greatest attention must be paid to reconnaissance. As has been apparent from the history of warfare, especially from the accounts of the last war, no complete surprise of the enemy has been achieved in any mine operation. On the other hand, rumors and warnings at the front often led to the starting of countermine operations against a suspected subterranean attack in places where the enemy had, in fact, not the least intention of mining, and often where circumstances excluded any real mine danger.

But the object of reconnaissance is not merely to recognize enemy subterranean activities; it is to effect this speedily enough to gain time and take countermeasures. For evaluating the results of reconnaissance, fundamental mine training experience is indispensable. Hasty or incorrect conclusions have unfailingly led to underground combat, whether desired or not, for it must be assumed that all mining operations will côme to the knowledge of the enemy and force him, in turn, to take his own countermeasures. The miner has no means of reconnoitering underground with any assurance of success other than by digging tunnels and shafts. The enemy becomes aware only of this excavation; its purpose remains unknown. In order to protect himself he must then do the same, and by reason of the short distance that separates the two forces, this operation necessarily leads to combat, and to combat which can end only by the evacuation of the underground region by one side or the other. Such was the case in all mine battles of World War I, in the Wytschaete Bend as well as on the Dolzok in Bessarabia, on Mt. Sief as well as on the Lagazuoi in the Dolomites.

(a) Reports

The treatment given to intelligence reports, especially those based on statements of prisoners, is the same as that given to all other reports in time of war. Only mining experts should be brought in for the examination and questioning of prisoners on the subject of mine operations. Otherwise, because the subject is equally foreign both to the prisoners and the ordinary examiner, the most unbelievable kind of reports will appear. Moreover, even reliable reports must be accepted with reservation. In the late autumn of 1917, for example, the report came to Mt. Pasubio from foreign sources, that in northern Italy a few special detachments of professional miners, and tunnel and quarry workers, were being formed and sent into the Pasubio region. While the statement was entirely correct, these detachments were, in fact, assembled for extensive highway construction with curved tunnels and galleries on the Pasubio massif, and had nothing to do with mine warfare.

(b) Observation

Observation can yield data which, when assembled, give a basis for estimating any underground activity of the enemy. Many conclusions can be drawn from the nature of the earth spoil. Here, geological observations are of special value. With continuity in observation which may disclose the scope of enemy work and its position in depth, miners need not without urgent reason be withdrawn from work that has been started, and thoroughly trained units need never be left behind underground should a sudden evacuation of the works become necessary.

Snowfall facilitates the recognition of large quantities of excavated material. Aerial reconnaissance should be carried out for the study of enemy diggings, as well as to locate the entrances to his mines, always carefully concealed from ground observation. In spite of the inadequacy of the reports, air reconnaissance in mine attack against permanent fortifications and mine systems prepared as a part of the fortifications is the only means of getting information in the first

phases of combat. Clear and positive results, however, can consistently be expected only through subterranean reconnaissance.

(c) Subterranean Reconnaissance*

i. General

Reconnaissance underground is done by ear. To completely reconnoiter the combat terrain, every means should be used to extend the sense of hearing in both vertical and horizontal directions. In the horizontal direction galleries are employed, and in the vertical direction, shafts. Listening apparatus must be installed to give the ear increased range, and arrangements made for organizing and coordinating the listening service.

ii. Listening Service

The listening service is furnished by individual listening posts in the galleries, and the men who man them must be thoroughly trained in sound detection. The work of the sound-detection miner is difficult. To lie for hours in a dark, wet hole underground, with your ear pressed to the ground, in constant uncertainty about your own fate, your head crammed full of imagined suspicious whispers and-what is of great importance--without the possibility of any comparison with the results at other listening posts--all this imposes severe demands on the listener.

The mine listener should be at home in any terrain, in any type of earth. He must know how the different types of soil transmit sound and how far they propagate them, and in order to understand all that can happen in mine warfare and so connect certain noises with particular phases of underground activities, he must be a military miner himself. The trained miner well knows how to distinguish sounds of engines, and whether a two-hammer or single-hammer unit is working. He knows the number of points where work is going on, and the number of drills (which, incidentally, are recognized as a sharper tap and never as a dull thud in rock). He must know whether the enemy is working in a gallery, in a mine chamber, or in a trench. Many times he can determine from the sound itself that most important moment in mine combat, namely, when the enemy is about to blast. In the mine combat on the Colbricon, a porphyry horn just beside the Rolle Pass (see fig. 6), the entire endangered region was evacuated, on the basis of what had been heard, 2 hours before the Italian blast. The regrouping for the occupation of the crater was then organized--in this case, of course, only a reoccupation of the expected debris-zone. All this was done without difficulty and not a man of the garrison was lost; the position was immediately reoccupied and a few minutes after the blasting it was as ready for combat as it had been before.

---

*The author has had no experience whatever with the new geophysical soil investigations and their applicability in the field of mine warfare.

iii. Sound-Detection Pauses

For the carrying out of the sound-detection service, sound-detection pauses in the entire listening area must be ordered by the commander. In these pauses every noise and all speech in the emplacement are to be discontinued, even on the surface. Such pauses are to be made at irregular time intervals according to the directions of the mine officer. What mistakes can occur is well illustrated in the following instance: On 24 January 1917 under Mt. Pasubio, clear voices and the sound of rolling equipment could be heard in the midst of the Austrian gallery. According to the sounds, the enemy seemed to be already under the Austrian position. A committee met, listened and came to the same conclusion; then, a short time later, the voices were recognized as Tyrolean.

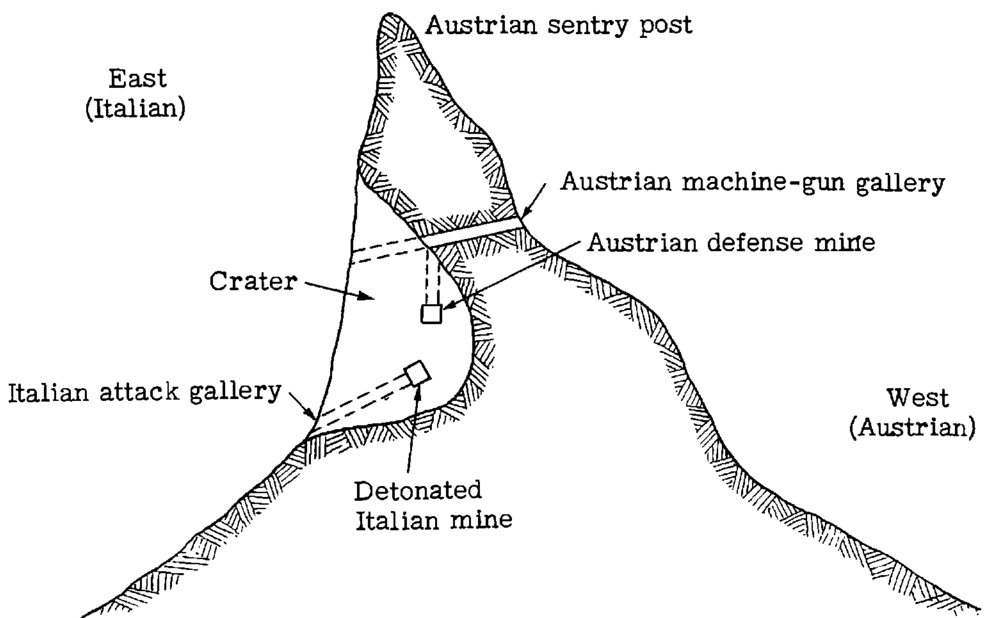


FIG. 6

In one of our own dugouts they had been paying no attention to the sound-detection pauses!

The sound-detection service has been given greater space here intentionally, for it is of absolutely vital importance in mine combats. Everything depends on its reliable operation.

(3) The Underground Advance (Extension of Mine Construction)

(a) General

The distinction between offense and defense underground is difficult to

maintain. The objective of the miner under all circumstances must be that of attacking the enemy's combat emplacements without involving his own. This is his duty, assigned exclusively to him; and his comrades in the surface fortifications must be able to rely on him. Therefore, the immediate mission of the subterranean defenders, whenever they learn of the intention and direction of the attacker, is to counterattack as far to the front as possible.

(b) Galleries and Shafts

The underground advance proceeds by way of galleries and shafts. Just as the troop-columns, whenever possible, utilize good, straight roads with shelters, supply, and other facilities, the same is true in the underground advance. The advance must be started with large galleries, for these passages must provide a clear roadway for the miners, with their loads of tools, respirator apparatus, and other material. The galleries must allow space for assembly areas and room for the storage of tools and tamping, blasting, and detonating materiel; for such transport arrangements as pushcart tracks and cable transport; for ventilation equipment with pipes a foot in diameter and drainage conduits, and often, also, for high and low tension cables, which must be kept at a distance from each other (fig. 7). Above on the right are the 12-inch ventilation tubes; on the side wall beneath are the low tension conduits for the sound-detection apparatus, as well as for the alarm and gas-alarm system. On the left is the practically noiseless suspension cableway, and at the extreme left, the high tension cable for the gallery lighting plant.

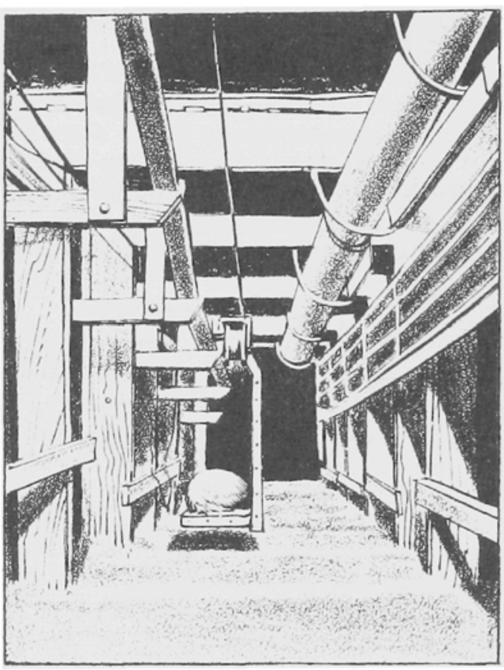


FIG. 7

After work has begun, any enlargement of the passageways can be done only in galleries cut in solid rock. (Note: This is due to the difficulty of side-bracing in earth.) Because of the effect of artillery fire, all structures must be built at least 60 feet underground, and any subsequent enlargement can be carried out only under great difficulty and with temporary loss of utility. To start with a cross section of small diameter, because of haste and urgency, has been shown in almost every case to be a mistake. As the galleries become longer, branch passages become necessary, imposing greater demands on transportation, traffic, and the bringing in of equipment.

For the beginning of the mine construction, beyond contact with the underground enemy, a gallery profile 4.5 feet high and 3.9 feet wide in the upper third, or 3.9 feet in diameter, will be the minimum dimension.* With further training and practice, under certain circumstances smaller dimensions can later be applied, with a smaller amount of labor and cubic volume of material to transport.

(c) Miners Should be Left to Their Own Work

At this point another war experience should be mentioned. This is the requirement of complete separation of mine construction from other tactical installations; otherwise the miner is seriously impaired in the performance of his duty of protecting the troops against the effects of underground events. Moreover, the maintenance of the secrecy of underground work is also made difficult. For example, in addition to the information from prisoners and deserters on this subject, we read in the reports from the Bessarabian front how, before each listening pause, a few mortar bombs were fired against the suspected enemy gallery entrances, whereupon in our galleries there could immediately be heard the sound of the running feet of the enemy garrison in their own mine galleries, and from this valuable inferences as to distances, etc., could be drawn. In close relationship to the requirement of secrecy, is that even more urgent need of exclusive subordination of mine work and miners to leaders of their own arms of the service, or under the higher HQ command, in order to be independent of the junior front-line commanders. Miners then will not be constantly used for other work which may seem more desirable to the local garrison. Otherwise, when the enemy has done his blasting, we will wonder why no precautions, or too few, had been taken on our own side. For experienced miners, historical military examples need not be quoted; they are not hard to find.

(d) Time Estimates

The efficiency of the miners' effort depends on a great many circumstances, but for the most part on the degree of their training. Within broad limits, the following time allowances may apply.

1. In Earth (with a high degree of training and normal conditions, such as good lighting and ventilation, previously prepared shoring material, etc.):

Shafts (per linear meter). . . . . . . 5 hours min., 9 1/2 hours max.

Galleries (per linear meter) . . . . . 4 hours min., 9 hours max.

In loam and clayey soil, a minimum of 1 hour and a maximum of 2 hours

*Note: This is a literal translation of the German. The types of cross section implied in the statement are not clear, and no illustrations are given in the original.

per linear meter, according to the length of the gallery, were required for hand removal at a distance from the enemy. In proximity to the enemy the rate dropped to 1.50 meters per day.

ii. In Rock. The achievements reported in the last war are absolutely undependable. They suggest, for a passage cross-section of 32 to 40 inches, an advance of 30 to 32 inches per hour with machinery, and 8 to 12 inches by hand. According to experience, however, the figures of 12 inches by hand and about 40 inches with the mechanical drill were the approximate daily, not hourly, work-accomplishment with our untrained soldiers. On Mt. Pasubio the Italians calculated, for their certainly well-trained stone workers, 80 inches of gallery advance per day.

e. Summary

(1) The weapon of mine combat, the mine itself, is almost absolutely certain of its objective in view of the small sphere of effect and the all-around uniform effect in every direction. The size of the mine is to be determined on the basis of its purpose, and can therefore always be accurately adapted to the nature and resistance of the objective. With the possibility of an unlimited increase in charges, the effect can also be practically unlimited in its concentration at one point. As regards casualties, the blasting effect can also be increased at will be means of the gas effect.

(2) The great moral effect of mine combat, from the beginning of suspicion that it is underway up to the detonation of the mine itself, has been repeatedly shown by military history. It is extremely difficult to counteract. Because subterranean attack can be made almost anywhere, the threat of its use is liable to be widely felt.

(3) The underground conduct of battle can be opposed only underground. It must be reconnoitered underground, with a very great outlay in time, work, and material. Combatting it on and above the surface is possible only to a limited extent, and under no circumstances with lasting success.

(4) Underground resistance to mine attack by means of mine defense, corresponding to the information disclosed by thorough reconnaissance, always can be a laborious process, involves many times the quantity of supplies and personnel as required by the attacker. In most cases only the installation of a complete and organized underground defense system will have any prospect of success.

(5) Because the site of combat is in the earth, and because of the extensive and difficult work required, the underground mode of battle is a very slow one and requires a great outlay of special troops and equipment. Its employment is therefore justified only against the most profitable objectives.

(6) The site of combat underground, where only one human sense, hearing, is capable of giving warning, stamps the underground mode of combat with the

mark of something unknown, something uncertain, which often forces both sides to take up underground combat unwillingly, and thereby to lose the advantage that rests with aggressive mining operations. This uncertainty also makes it difficult to evaluate the plan and the intention of the enemy, the phases of the battle, and the prospects of success.

(7) The abandonment of the combat area, which is one way of meeting a threatened mining attack, implies a locally limited failure in the campaign. However, it is an absolute defeat in the combat for permanent fortifications, confined to a limited locality, with their system of mutually supporting defenses. For this reason permanent fortifications have always been a proper field for mine combat.

(8) Uncertainty always makes mine combat an expensive, tedious method of battle, seeming to the non-expert more of a hidden game of chance than an open combat. It can be met only by a firm will based on one's own knowledge of mine operations.

(9) Lack of technical knowledge is apt to arouse the belief that luck alone is the controlling factor in mine combat. Luck certainly belongs there, but no more than in any other form of combat.

[redacted]

TACTICAL AND TECHNICAL TRENDS

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MILITARY INTELLIGENCE SERVICE,

WAR DEPARTMENT

[redacted]

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SECTION I

AIR

1. ITALIAN MACCHI 205

A report recently received of the first examination of the Macchi 205, a new Italian single-seat fighter, indicates that this plane is structurally identical with the 202 (see Tactical and Technical Trends, No. 22 p. 1) and not easily distinguishable from it. It is a single engine, low wing monoplane, with a moderately-tapered wing, and camber-changing flaps inter-connected with the ailerons. There is an adjustable stabilizer, and the landing gear retracts hydraulically inward.

As was anticipated, the basic Macchi 202 (see sketch) airframe has been retained, but a somewhat surprising development was the installation of a Daimler-Benz 605 engine similar to that in the Me-109G instead of a reported new Italian Isotta-Fraschini in-line engine, suggesting that the latter may not have been a success. The D.B. 605 A-1 engine fitted in the MC-205 examined was built by Fiat, under license.

Armor protection is the same as on the 202, with the pilot's shaped one-piece bucket seat of the same dimensions and thickness of 8 mm. Also the head piece of 8 mm, which fits the back of the head fairing, is the same. There is a 2 inch laminated, bullet-proof windshield. A semi-circular section of plate, 8-mm thick and 10 inches high by 22 inches wide, is attached to the top of the front end of the gasoline tank, behind the pilot's head, effectively covering and overlapping the 7-inch gap between the seat back and the head piece.

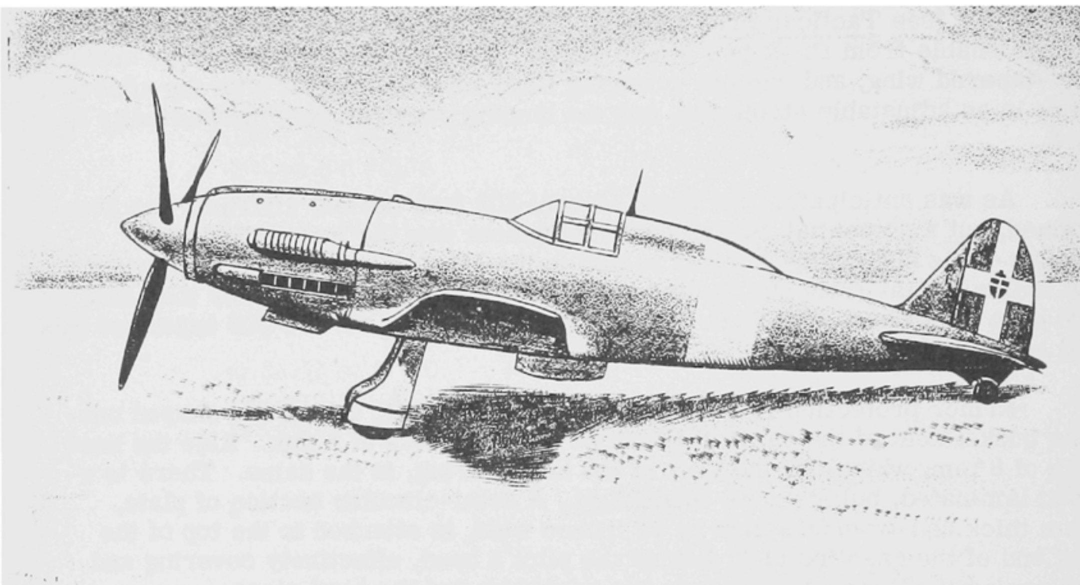
Fuel capacity of the 205 is the same as the 202, there being one tank immediately behind the pilot's head, one beneath his legs, and one small tank in each wing root.

The original armament of the 202, consisting of two 12.7-mm Breda machine guns on fixed mountings above the motor, with centers 14 inches apart, has been increased in the 205 by the installation of two 7.7-mm Breda light machine guns, one in each wing at a point 11 feet 7 inches from the wing tip, the muzzle being recessed 2 inches behind the leading edge. Ammunition capacity for the 12.7-mm machine guns is the same as for the MC-202, 350 rounds per gun. Each 7.7-mm gun is fed from a container, housed below the skin of the upper surface of each wing, outward towards the wing tips. The container is 2 feet 3 inches long by 8 inches deep by 3 inches wide. Further unconfirmed reports suggest that later models may be equipped with a 20-mm shell-gun.

No bomb carrier or bombing equipment were fitted, but it is reported that two 220 pound bombs can be carried.

All radio equipment had been removed from the aircraft examined, and most of the other instruments, but the cockpit layout appeared identical to that of the MC-202. The control column was marked "202". A control box found, indicated the use of B .30 type radio, but without the direction finder, the relative switch being locked at "off". Racks in the fuselage showed that the transmitter and receiver had been fitted.

Although the MC-205 has not yet been identified in any substantial numbers, it appears likely that this is due to its resemblance to the 202 and that in fact they are operational in the Mediterranian at the present time. As it is one of the latest



Italian fighters, it may well be that the Italians have finally abandoned their concept of a 2-gun fighter, and are making the addition of wing-guns a standard modification.

ANTIAIRCRAFT

2. GERMAN 105-MM ANTIAIRCRAFT GUN

The 105-mm gun, of which two models (10.5-cm Flak 38 and 39) are in service, is a standard German heavy antiaircraft gun. The gun is produced in both fixed and mobile versions, and is also mounted on railway mounts.

In the antiaircraft role the gun is controlled from a command post equipped with a director. A telescopic sight is provided for fire against ground targets. The gun, though reliable and well made, has the following disadvantages:

Excessive weight--about 14 tons in traveling position
15 to 20 minutes necessary to bring the gun in and out of action

a. General Data

Muzzle velocity	2,890 f/s
Maximum horizontal range	19,100 yds
Maximum vertical range	36,700 ft
Maximum effective vertical range	31,000 ft
Rate of fire	10 - 15 rpm
Length of piece	21.8 ft (61 cals)
Length of bore	18.2 ft (52.7 cals)
Twist of rifling - increasing	Angle not known
No. of grooves	36
Width of grooves	.217 in
Depth of grooves	.051 in
Width of lands	.142 in
Elevation	-3° to $+85^{\circ}$
Traverse	360°
Recoil	30.71 to 35.43 in
Weight in action	11 tons (approx)
Weight in traveling position	14 tons (approx)

b. Ammunition

Three types are fired:

(1) H.E. shell with time fuze; this shell is used for antiaircraft and is fitted with the same clockwork fuze as that used with 88-mm antiaircraft ammunition.

Weight of complete round	58.3 lbs
Weight of projectile (fuzed)	33.2 lbs
Weight of bursting charge (trotyl)	3.3 lbs
Weight of propellant (diglycol)	10.9 lbs

(2) H.E. shell with percussion fuze

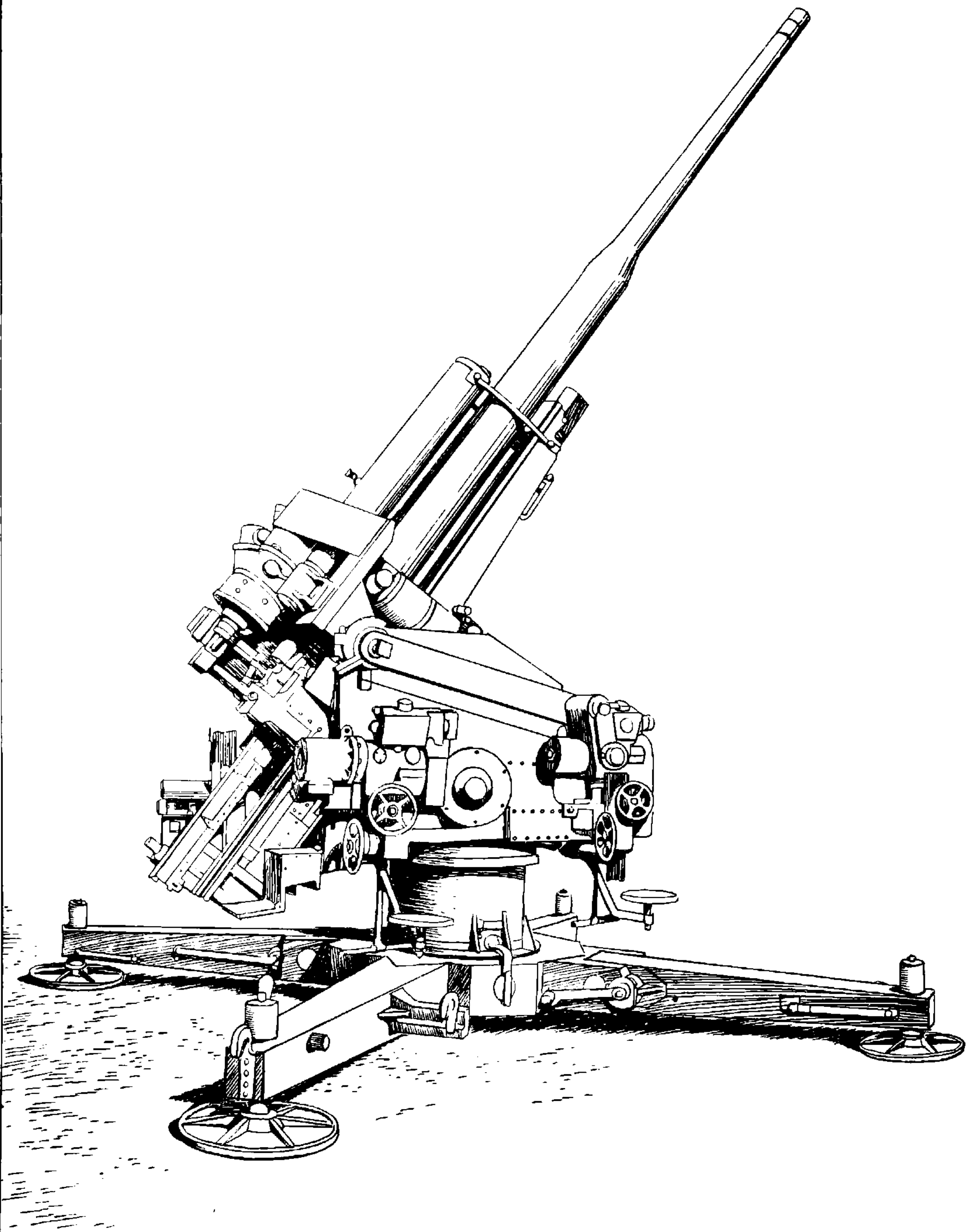
(3) APCBC* shell

c. Penetration Performance

The following are estimated penetration figures for the weapon firing APCBC shell against homogeneous armor:

Range (yards)	Thickness of Armor 30°	Thickness of Armor Normal
1,000	5.53 in	6.54 in
1,500	5.16 in	6.06 in
2,000	4.78 in	5.65 in

*Armor-piercing capped, with ballistic cap



GERMAN 105-MM ANTIAIRCRAFT GUN

d. The Piece

Information regarding the piece is at present fragmentary. The breech is horizontally sliding and semi-automatic. The breech mechanism is automatically cocked as the gun moves back into battery, and the electrical firing circuit is completed by the closing of the breech.

e. The Carriage

The carriage has two side arms which are folded up for transport. A boss joins the main body of the carriage to the upper mount, which rotates on the boss by means of a traversing plate and a shaft which is connected to the traversing mechanism. The traversing and elevating gears have two speeds for manual operation; provision is also made for power operation.

f. Automatic Fuze Setter and Loading Mechanism

Both the fuze setter, which is fixed to the gun, and the loading mechanism are power operated.

The loading mechanism consists essentially of two trays. The loader places the round in tray 1, which is automatically gripped by the fuze setter. The loader then operates a handle on tray 1 which causes the fuze setter to release the round and transfers it to tray 2. Tray 2 moves automatically into position behind the breech and the round is loaded. As the round goes forward the rim of the cartridge case strikes a cam on tray 2, thus returning it to its original position.

g. Power Supply

Each gun battery is provided with an 8-cylinder gasoline engine which drives a DC generator producing:

Voltage	220
Amperage	200
Power	24 kw.

From the generator the current is led to a central distributing box whence it is supplied to the guns. Each gun has four electric motors as follows:

	Voltage	Power (kw)	Rpm
Elevation	220	1.5	1,200
Traversing	220	1.1	1,050
Loading	220	1.0	1,420
Fuze setting	220	0.1	1,400

3. GERMAN GUN-FIRE DEFENSE AGAINST LOW-FLYING HOSTILE AIRCRAFT

In Tactical and Technical Trends, No. 14, p. 8, the question of putting up a defense against attacking enemy aircraft indicated how the use of every weapon capable of pointing skywards was found to be the best means of meeting such attacks.

According to a translated German document, reprinted below, emphasis is placed on the heavy losses occasioned in men and materiel by fire on low-flying aircraft by infantry weapons, including the rifle. The translated document reads as follows:

* * *

Attacks by low-flying hostile aircraft have repeatedly caused serious losses. Despite this, units often fail to take advantage of the opportunity to destroy hostile aircraft. Lack of a defense of any kind often facilitates the enemy's accomplishing his mission.

Yet it has been proved that heavy losses in men and material are caused by fire from infantry weapons. Aircraft are very fragile and are grounded for a considerable time by hits in the motor, fuel tank, magazine, wiring etc. A considerable defensive effect is already accomplished when the pilot is impeded in directing his fire, or when his aircraft is damaged.

Hostile pursuit bombers frequently approach in low flight and start to gain altitude only shortly before their attack. Therefore, they cannot be picked up by our air raid warning sentries early enough to permit our own fighters to arrive on time. The fire of all available weapons, including the rifle, is at that time and in these cases, the most effective antiaircraft defense.

How is the attack by low-flying aircraft repulsed?

The coordinated fire of all weapons not being employed in the ground fight offers the greatest possibility of defense.

Officers of all grades are responsible for the immediate and energetic defense against attack by low-flying aircraft. They are the first to open fire on the flying target. Antiaircraft fire is best opened with a salvo. The defense is continued with rapid rifle fire. The attacking aircraft is thus met by a hail of steel. No aircraft is invulnerable! Therefore, here, also, attack is the best defense.

Rifle fire directed at aircraft flying above 2,000 feet is not effective and only serves to reveal your own position to the enemy.

Every soldier - no matter what arm of the service - must be indoctrinated with the firm will to shoot the attacker out of the sky.

4. ATTACK AGAINST GERMAN HEAVY TANK--PZKW 6

Construction details about some of the features of the new German heavy tank have already been described in Tactical and Technical Trends (see No. 24, p. 6 and No. 20, p. 7).

The following report by an observer on the Tunisian front furnishes some comments as a guide to training in antitank action against this tank.

It appears that the first of these tanks to be destroyed in this theater were accounted for by British 6-pounders (57-mm). An account of this action, as reported by a British Army Officer, follows:

"The emplaced 6-pounders opened fire at an initial range of 680 yards. The first rounds hit the upper side of the tank at very acute angles and merely nicked the armor. As the tank moved nearer, it turned in such a manner that the third and fourth shots gouged out scallops of armor, the fifth shot went almost through and the next three rounds penetrated completely and stopped the tank. The first complete penetration was at a range of 600 yards, at an angle of impact of 30 degrees from normal, through homogeneous armor 82-mm (approximately 3 1/3 inches) thick. Ammunition used was the 57-mm semi-AP solid shot.

"One element of this action contains an important lesson that should be brought to the attention of all AT elements and particularly tank destroyer units.

(a) "The British gunners did not open until the enemy tank was well within effective range.

(b) "In addition to opening fire with their primary weapon--the 57-mm--the AT unit also opened with intense light machine-gun fire which forced the tank to button up and in effect blinded him. His vision apparently became confused and he was actually traversing his gun away from the AT guns when he was knocked out for good.

(c) "Once they opened fire, the British gunners really poured it on and knocked out one more heavy tank and six PzKw 3s. Also, for good measure, one armored car."

The conclusions to be drawn from this action, according to the British officer quoted, are:

(a) "The unobstructed vision of the gunner in a tank destroyer gives him a very real advantage over his opponent squinting through the periscope or narrow vision slits of a tank.

(b) "The tank destroyer unit must force the enemy tank to 'button up' by intense fire from every weapon he has, including machine-guns, tommy guns, and rifles."

The size and weight of a tank such as the PzKw 6 present many problems. It has been indicated from unofficial enemy sources that extensive reconnaissance of terrain, bridges, etc., was necessary before operations with this tank could be undertaken. Bridges have to be reinforced in many cases, and soil conditions must be good for its effective operation. It can therefore be assumed that its field of operation is limited.

Reports so far indicate that the use of this tank is chiefly to support other armored units, including employment as mobile artillery. As a support tank it is always in rear of lighter units. In one reported skirmish in Tunisia, the lighter units formed the spear-head; as soon as enemy tanks were decoyed into range the lighter tanks fanned out, leaving the heavier tanks in the rear to engage the enemy units.

The PzKw 6 is now considered a standard German tank. Present production figures are believed to be at a maximum of 800 per month.

ARMORED

5. GERMAN SUBMERSIBLE TANKS

The delays and difficulties involved in the transport of tanks across the rivers of Eastern Europe have no doubt forced the Germans to consider very seriously all possible devices for enabling their standard tanks to cross such water obstacles under their own power.

a. The PzKw 3

By the summer of 1941, the weight of the PzKw 3 had already been increased by the fitting of additional armor, and it must have been clear that future developments in armor and armament would necessarily involve still further increases in the weight of this tank. While the trend towards increased weight was in many ways disadvantageous, it was definitely helpful in overcoming one of the major difficulties hitherto encountered in adapting standard tanks for submersion, namely the difficulty of obtaining sufficient track adhesion.

It is therefore not surprising that the Germans, in the early stages of their campaign in Russia, were actively experimenting with standard PzKw 3's modified for submersion. These experiments met with a certain degree of success, and under-water river crossings are reported to have been made with these modified tanks under service conditions. The measures employed, according to a Russian source, included the sealing of all joints and openings in the tank with india rubber, and the fitting of a flexible air pipe, the free end of which was attached to a float. The supply of air for the crew as well as for the engine was provided for by this flexible pipe. The maximum depth of submersion was 16 feet and the time taken by trained crews to prepare the tanks was about 24 hours.

In April 1943, a PzKw 3 Model M examined in North Africa was found to be permanently modified for immersion, if not submersion. There was no mention in the report on this tank of a flexible pipe with float, but this may have been destroyed, since the tank, when examined, had been completely burnt out.

The engine air louvres were provided with cover plates having rubber sealing strips around their edges. These cover plates, which were normally held open by strong springs, could be locked in the closed position before submersion. After submersion, the springs could be released by controls from inside the tank. When submerged, air for the carburettor and for the cooling fans was apparently drawn from the fighting compartment. If, therefore, a flexible pipe were used with this tank, no doubt its purpose would be to supply air to the fighting compartment to replace that withdrawn for the carburettor and cooling fans. The two exhaust pipes led to a single silencer mounted high on the tail plate with its outlet at the top. This outlet was fitted with a spring-loaded non-return valve, which during normal running could be secured in a fully open position.

b. The PzKw 6

More recently still, documents and reports from Russia have shown that the standard PzKw 6 is equipped for submersion to depths of up to 16 feet. In this tank there is provision for hermetically sealing all joints and openings, the doors and covers being provided with suitable rubber seals. The radiators are separated from the engine by a water-tight partition so that, when the tank is submerged, they can take in water from outside the tank, with the cooling fans switched off. Carburettor air in this case is drawn through a flexible pipe, the free end of which is supported by a float, but there appears to be no additional supply of air for the crew. A small bilge pump is also fitted to dispose of any water which may leak into the hull through the various seals, packings and stuffing boxes.

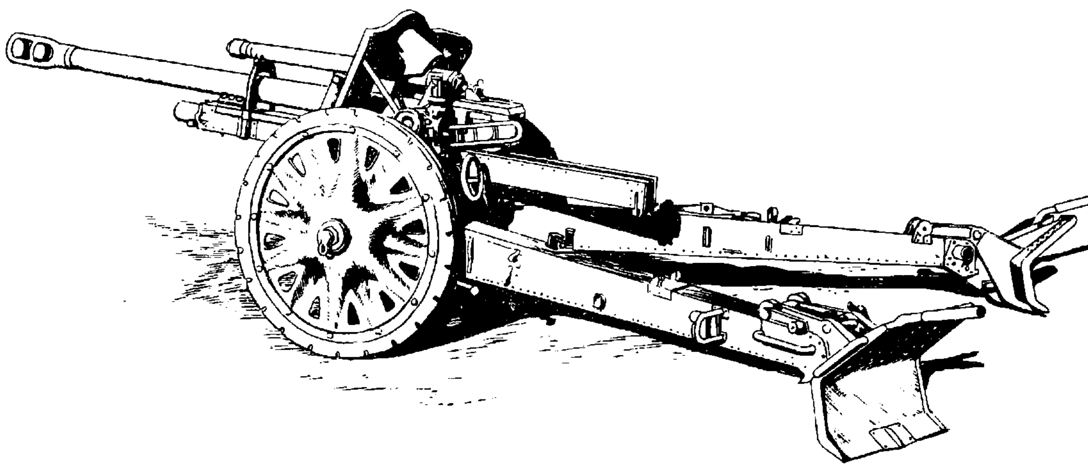
It is clear that the PzKw 6 requires only the minimum amount of preparation by the crew before submersion and that its design must have been influenced from the beginning by the requirement that it should be readily submersible. It is quite possible that the PzKw 6 could be submerged to greater depths than 16 feet if it were fitted with a longer air pipe, since, although this tank is little larger than the PzKw 3, it is nearly three times as heavy, and track adhesion is unlikely therefor to be a serious problem.

ARTILLERY

6. NEW GERMAN 105-MM GUN-HOWITZER

The standard German light field artillery piece is the 105-mm gun-howitzer, generally similar in appearance to the U.S. 105. It weighs about 5 1/2 tons, fires a projectile weighing about 32 pounds, and has a maximum range of about 11,000

yards. The German designation for this gun is "10.5-cm L. F.H."* 18." A few months ago, however, what appears to be a modification of this weapon was captured in Africa; it is believed to be the "10.5-cm L. F.H. 42." The "42" may also exist as a self-propelled gun; if so it is the first German field artillery piece so mounted.



NEW GERMAN 105-MM GUN-HOWITZER (18M)

In external appearance the most apparent difference in the two guns is the muzzle brake on the "42", a feature not known to be included in the "18", though it has been reported that there is an "18" with a muzzle brake which may possibly be designated "10.5-cm L. F.H. 18 M."** The muzzle brake is of the standard double-baffle type, quite similar to the muzzle brake on the 50-mm antitank gun.

While the wheels of the "18" are made of a light alloy (current models may be of wood) the "42" has wheels at least partially constructed of wood; both types are rimmed with solid rubber tires as is usual in German artillery guns.

The main differences between the "18" and "42" are as follows:

	10.5-cm L. F.H. 18	10.5-cm L. F.H. 42
Length of gun (including breech ring)	106.8 in	117.75 in
Length of gun (including breech ring and muzzle brake)		130.87 in
Length of barrel	97.1 in	108.5 in
Length of bore	94.2 in	95.62 in
Length of chamber	8.35 in	12.87 in
Twist of rifling	Increasing 6° to 12°	Not Available

*Leichte Feldhaubitze--light field howitzer

**Abbreviation for Mundungbremse meaning "muzzle brake"

The "42" with its longer bore and chamber would appear to have a higher muzzle velocity than the "18." This seems to be borne out by the fact that captured "42's" are provided with a muzzle brake and have range table corrections painted on the shield of the gun. These tables, giving corrections for various charges, vary from minus 2 mils for an elevation of 100 mils to minus 70 mils for an elevation of 750 mils; presumably no range tables for the "42" exist or were available and it was necessary to use the "18" range tables with the above noted corrections to compensate for the greater muzzle velocity of the "42" gun. In addition to these necessary corrections it is also of interest to note that a special table for charge 6 (hollow-charge ammunition) was also painted on the shield as follows:

Range (meters)	Elevation (Strich--mils)
400	7
600	11
700	14
800	16
900	19
1,000	22
1,100	24
1,200	27
1,300	30
1,400	33
1,500	36

ENGINEERS

7. CLEARANCE OF GERMAN MINEFIELDS IN TUNISIA

The mine menace is a formidable problem and one of general application. It has been stated, and with considerable truth, that the land mine is considered to be more of a menace to inexperienced troops than was ever the dive bomber.

In the No. 43-34 issue of Informational Intelligence Summary, prepared in the Office of the Assistant Chief of Air Staff, Intelligence, a report of an interview with Brigadier General D.A. Davidson contains some interesting observations in connection with the story of landing fields in North Africa. In dealing with the difficulties incident to taking over former German fields, from the point of view of the mine hazards in the vicinity of Tunis and Bizerte, General Davidson submitted the following:

We had anticipated a great deal of difficulty with those Tunisian fields because we had learned the thoroughness with which the Germans mined those areas which they took time to mine. We had very little to worry about, however, because the break came so rapidly that the Germans did not have time to mine the Tunisian fields. However, in one runway of the group of fields between Bou Arada and Pont du Fahs, we took 1,788 antitank mines. That sounds as if it were a hazardous undertaking. We found that was not so. We used a technique for de-mining an area which the aviation engineers had developed in their school.

Discovery of mines in any locality was made possible by sending out men at intervals of fifty feet and moving forward. Each man was furnished with one of our excellent mine detectors. As soon as a man would detect a mine, we would close into that area and determine the pattern. Thanks to the German habit of thoroughness and orderliness, we found the patterns always regular. As soon as we would discover what it was, we could almost draw a map of the minefield without seeking out each individual mine. Having determined the pattern, and where the individual mines were, we would then send two men forward, one of whom went on his hands and knees and very gingerly scraped the earth away. There were usually eight to nine inches of earth over the mine. He uncovered the mine and neutralized it by unscrewing the main detonating cap in the center. That, however, did not make that mine safe because it might be booby trapped from the side or the bottom. There may be another exploder screwed in on the side or the bottom. If there, it is anchored into the ground. If one lifts, or tries to move a booby-trapped mine, he sets it off, even though he has taken out the main detonating cap fuze. So the task of the first two men was simply to uncover the mine and carefully feel around it to see that it was not booby-trapped from the side.

Next, two more men came up--one of them with a light rop lasso, which they put over the mine. They then fell back about fifty feet and shouted, "mine." Everybody lied flat on his belly, and then the mine was jerked out. If it was booby-trapped, it exploded fifty feet away from anyone. With everyone lying down there was very little chance of a person being hit. We never had a casualty from de-mining a field. If the mine wasn't booby-trapped, it came tumbling out and there was no harm done. It took us about eight hours to take up these 1,788 mines, so it wasn't a particularly hazardous or long drawn-out task.

If we had had to apply that technique to each one of the field in Tunisia, we figured out long ago that it would save us time to make new fields. We had selected the sites and were prepared to construct new fields. The fact that we didn't, meant that the air forces could move into their rest areas much more quickly than would otherwise have been the case.

MEDICAL

8. GERMAN HEALTH PAMPHLET FOR NORTH AFRICA

The German pamphlet translated below contains information on general health precautions, which are not only of interest and value in themselves, but

also because of their close similarity to official U.S. Army medical instruction and principles of sanitation. While the pamphlet has reference to the North African area, much of it is applicable to all areas and is therefore of general interest.

The pamphlet was issued by the office of the German Army Surgeon General and is dated 1942. As is apparent from the context, it is intended for the individual soldier. Instructions accompanying the pamphlet state that it is to be carried in the inside flap of the paybook.*

The translation of the pamphlet follows:

* * *

The climate of the country is quite different from that of your homeland. The days in summer are hot and sunny, in winter, warm; the nights, on the other hand, are cool in summer, in winter, very cold. Throughout the entire country, water is very scarce. The German soldier must, first of all, accustom himself to the climatic peculiarities. The population of the country has different customs, ways of living, and practices, than our people. They have a different religion. Do not disregard all this in association with the people of the country. You will get on much easier. There are illnesses there which we do not have in Germany. You must, therefore, know the dangers which threaten you in this particular country.

Observe the following:

(1) Water

The virus of many different kinds of diseases can come from the water of this country. Therefore, never drink unboiled water, also do not rinse out your mouth with it, as long as your superior officers do not designate the water pure! Boil your water! It is best to drink tea or coffee and use the portable filter apparatus. It makes all fresh water potable!** Drink no mineral water and no lemonade as long as it has not been expressly designated as harmless by your superior. Ice in restaurants and ice-cooled drinks, which are offered for sale on the streets, are not prepared under sanitary conditions and, therefore, are harmful to your health; avoid them, even if you are extremely thirsty. Do not wash yourself in dirty water, do not bathe in streams, lakes, ponds, pools. Bathing in the sea is permitted. Do not bathe when in an overheated condition.

*The paybook is carried by all German soldiers and is often found on German prisoners; aside from containing the pay record of the individual, the paybook also includes the soldier's unit, although it may not be up-to-date in this respect, and such miscellaneous personal data as gas mask size, blood type, etc.
**If this statement is correct, the filter probably includes an element to chlorinate the filtered water.

(2) Nutrition

You will receive the best food from your unit. Do not eat raw meat. Never drink unboiled milk, especially not goatmilk! Wash all fruit in purified water or peel it before eating. Do not buy quarters or halves of melons when they are offered by street merchants. Buy only whole, uncut melons. Do not pick up any food from the ground, especially meat, fish, and sausage; in the heat, foodstuffs perish quickly and contaminate! Protect your rations from flies. They carry disease.

(3) Dress

Always wear a stomach band.* You protect yourself against catching cold. Always wear your sun helmet out of doors during the heat of the day. Otherwise, wear your field cap. It serves no purpose and is harmful to the health to run about in warm countries with the upper part of the body naked. It is a mistake to believe that one is cooled off in that manner. When the air-temperature is greater than 38 degrees Centigrade [100 degrees Fahrenheit] the wind has a heating effect on the skin.

(4) Bivouac

Avoid particularly the dwellings of natives. Before you take up quarters in houses or barracks, clean the area thoroughly. Excrement and refuse are the breeding places of flies, and these carry to food-stuffs or direct to people the germs of dangerous illnesses (especially dysentery). Therefore, latrines must be free from flies. The trench-latrine serves the purpose.

(5) Vermin

Besides flies there are body lice, ticks, mosquitoes, snakes, and scorpions in this country. Mosquitoes are carriers of fevers, and malaria. Combat the mosquitoes in the morning and in the evening in your barracks by continuously killing them. If you burn a light in your barracks, keep the windows closed when possible; mosquitoes are attracted by burning lights. Use your mosquito net when you go to bed. Be careful, however, that when you lie under your mosquito net that there are no mosquitoes in the net and that the net is carefully tucked in under the bed and no openings are left for mosquitoes to enter.

If you have body lice, report it immediately: body lice and ticks carry spotted fever and relapsing fever, and both are serious illnesses. The snakes in this country are poisonous. They hide themselves in the sand. Scorpions are often found under loose rocks. Therefore, do not run about with bare feet and naked legs. Inspect your sleeping-bag daily for snakes and scorpions. Shake out your boots before putting them on. They are a favorite hiding-place for scorpions.

*Stomach bands are not believed to serve any useful purpose and are not recommended by the U.S. Army Medical Corps.

It is frequently maintained that a drink of liquor is beneficial after you have suffered a snake bite. This is foolishness. Alcohol, under such circumstances, is harmful. If you should be bitten by a snake, apply a tourniquet directly above the wound on the side toward the heart. The pressure applied to the tourniquet should not be great enough to cause the wounded part to swell and turn blue. With a disinfected razor blade, make a cross-like incision at the wound. Each cut should be at most about 1 inch long and not deeper than 1/2 inch. Allow the wound to bleed for 3 minutes; sucking the poison from the open wound is frequently recommended. This should be undertaken only by one who has no open sores or cavities in his mouth. With the blunt side of the disinfected razor blade, rub several potassium permanganate crystals into the wound; bind the wound and remove the tourniquet. Then report to the unit surgeon or medical officer immediately.

(6) Venereal Diseases

Women who solicit freely are usually infected. You should visit those houses only which are approved by the military authorities.* Always use a condom. Follow orders, and take a prophylaxis after having exposed yourself.

(7) Concerning Animals

Dogs and cats are frequently carriers of diseases, e.g., rabies, serious worm and blood diseases. Do not handle dogs, cats, or monkeys.

(8) Vaccinations

The vaccinations prescribed by the military authorities protect you from serious diseases. The unvaccinated person not only endangers himself, but the lives of his comrades as well!

(9) Prevention of Malaria

Do not hesitate to take tablets to prevent malaria, when they must be taken! You do not know the danger to which you and your comrades are exposed.

(10) Skin Irritation ("Red Dog") **

"Red dog" (roter Hund) is an annoying skin irritation, which is caused by excessive heat and attended by extreme perspiration. Frequent bathing in warm water and lathering with medicinal soap (when available) is the best protection. If you have "red dog," lather yourself with medicinal soap, and allow the lather to remain on your skin for 15 minutes. Blot yourself dry--do not rub. Dry yourself especially carefully in those parts where the conformation of the body causes skin wrinkles and between the toes.

*In North Africa the Germans and Italians organized houses of prostitution for use of military personnel. This is contrary to U.S. Army practice.
**Prickly heat is undoubtedly what is here referred to.

(11) Slight Injuries

If you receive a slight wound on the calf of your leg from a thorn, or from striking against a sharp rock or from insect stings, apply a sterile bandage. If you allow such apparently trivial wounds to go unattended, they can develop into annoying and slowly healing sores.

INFANTRY

9. GERMAN NIGHT FIGHTING TACTICS

Based on experiences in Russia, the following are some German notes on night fighting.

*   *   *

a. General

Attacks on a wide front were less frequent than strong thrusts at selected points. Small operations with selected personnel were often carried out.

Special features of Russian methods are skillful use of darkness, surprise at dawn, silent raids on positions, clever digging at night, opening fire at short range with the use of flares, and eagerness to get to close quarters. When the ground is lit by the defenders with flares the enemy seldom attacks.

b. Equipment

For night fighting, it is recommended that a cap be worn, as it permits better hearing than does a helmet. Belt and shoulder straps should be removed. The collar should be open, and shoes and leggings laced. Ammunition can be carried in pockets and grenades in a sandbag. A pistol, dagger, and sharp spade should be carried. The first-aid kit should also be taken along.

Certain individuals will carry Very pistols, wire cutters, explosives and incendiary material, and matches which can be used in wind ("wind matches"). Machine guns, automatic rifles, submachine guns, and rifles will be ordered according to circumstances.

c. Approaching the Enemy

If possible, try to approach against the wind.* Move in twos. If a single enemy is encountered, get under cover, let him pass, and then spring on him from behind.

*Men who have not bathed for a long time can be smelled downwind at some distance. Sound carries better downwind.

Wire should be cut where dark background, craters, small hollows or bushes make crawling forward easier. To deceive the enemy, sacks and similar material can be hung up at other points, or fire opened at one point to allow silent forward movement from an entirely different direction.

Simple signals should be arranged beforehand, such as bird-calls, etc.

d. Assault Troop Operations

Suitable composition and order of march are as follows: Riflemen; section leader; long-distance hand grenade throwers; short-distance hand grenade throwers; hand grenade carriers; light machine-gun section. Flank protection, using machine guns and additional riflemen, is advisable.

e. Defense

In order to insure that riflemen do not mistake direction, rifles can be fixed in position with pegs while it is still light, so that when a position is occupied in the dark there is no difficulty in fixing the direction of fire.

ORDNANCE

10. AP AMMUNITION FOR GERMAN 8.8-CM FLAK 41

This new German 88-mm antiaircraft gun has already been described in Tactical and Technical Trends (No. 29, p. 5). The ammunition fired is HE, with either time or percussion fuze, and APCBC;* the weights of the projectiles are 20.68 and 22.44 pounds respectively. While an estimated muzzle velocity of 3,400 f/s was reported in Tactical and Technical Trends, it now appears from captured range tables that with HE the muzzle velocity is 3,280 f/s, with APCBC 3,214 f/s.

The total length of the APCBC round is 45.63 inches and the total weight 46.2 pounds. Each round is separately packed in a metal cylinder. The German nomenclature is "8.8-cm Pzgr. Patr.* Flak 41." The following are some of the details of this ammunition.

a. Projectile

Externally the projectile resembles the standard APCBC projectile for the older 88-mm gun. It is fitted with a ballistic cap, a piercing cap and double rotating band. The rotating bands of the specimen examined were iron, but in projectiles

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*Armor-piercing capped, with ballistic cap
**Abbreviation for Panzergranate Patrone, loosely translated "armor-piercing round."

for the older 88-mm gun, both iron and bimetallic bands have been encountered. The bursting charge is small and consists of 60 grams (.13 lb) of cyclonite. A Bd.Z* 5127 and a tracer are fitted. The base fuze operates as follows. A fixed igniferous detonator is situated below a striker with a compressed spring. The striker is held off the detonator by two balls which are kept in position by a collar located round the fuze body. The collar is kept in position by a shear wire. Upon impact, the collar sets forward against the shear wire and breaks it, the balls being thereby released. The striker, under the action of its spring then hits the detonator.

The projectile is painted black and has a white tip. This, however, is not a specific indication for a projectile for the Flak 41 since it is known from documentary evidence that a similar projectile with similar markings is used in the older 8.8-cm gun. The weight of the projectile is 10.2 kilograms (22.44 pounds).

b. Cartridge Case

The cartridge case is necked and the specimen examined was made of brass. It carried no design number, but 8.8-cm Flak 41 was stamped on the base. It had the following dimensions:

Overall length	33.66 in
Length from base to shoulder	29.33 in
Length from shoulder to mouth	4.33 in
Diameter of rim	4.72 in
Diameter above rim	4.33 in
Diameter at shoulder	3.98 in
Diameter at mouth	3.50 in

An electric primer is fitted. The propellant consists of 11.91 pounds of tubular flashless propellant. The sticks have the following dimensions:

Length	29.13 in
External diameter	.189 in
Internal diameter	.059 in

An igniter containing the usual German igniter powder is fitted.

11. GERMAN MG-151 TYPE 15- AND 20-MM AIRCRAFT WEAPONS

A brief description of both of these types of aircraft gun was reported in Tactical and Technical Trends, No. 12, p. 2.

a. MG 151/15.

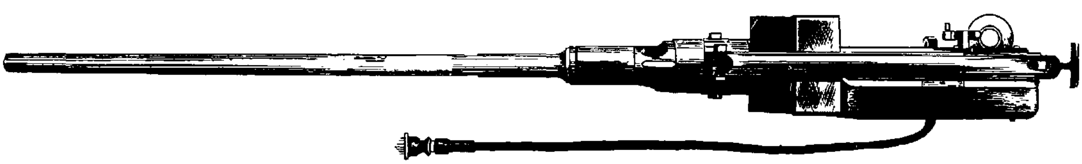
Additional information about the 15-mm weapon indicates that it is of Mauser design, manufactured by Rhein Metall, well constructed, and with excell-

*Abbreviation for Boden Zünder, meaning "base percussion fuze."

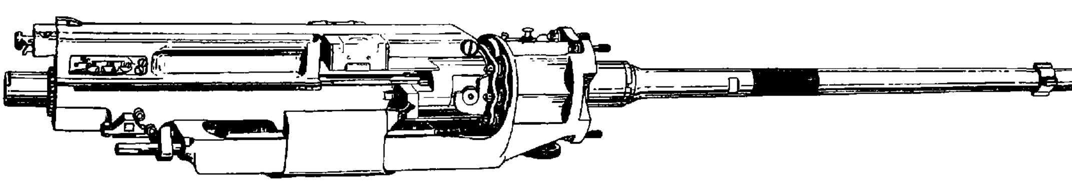
ent performance. As noted in the previous description, this gun (as well as the 20-mm) is cocked and fired electrically; the cocking mechanism consists of two sprockets and a roller chain driven through a train of gears by a small high-speed motor. Subsidiary hand cocking is done by a chain ending in the cross-bar at the rear end of the breech cover.

There is no applied safety device as electrical safety only is provided. Provisions are for automatic firing only. The firing is by electrical solenoid operating a sear release. The gun is recoil operated unassisted by muzzle blast. The system of feed is by disintegrating metal link belt.

There is a resilient front mounting comprising a cylinder sliding in an outer housing and acted upon by four double-acting buffer springs and 2 buffer brakes. The sliding cylinder has 2 hooks which engage with lugs on the gun casing to lock the gun and mounting together. The rear of the gun is supported by 2 annular bushings mounted in a bracket and sliding on 2 cylindrical rails attached to the aircraft structure.



GERMAN AIRCRAFT CANNON MG 151/15



GERMAN AIRCRAFT CANNON MG/151 20

b. MG 151/15 and 151/20 Compared

Sometimes it is erroneously supposed that the MG 151/15 and the MG 151/20 are the same gun fitted with interchangeable barrels. Though of basically identical design and similar appearance, they are separate and distinct weapons.

The MG 151/15 was first encountered, installed in the Heinkel 115. German aircraft now mounted with the MG 151/15 as standard armament are the following: JU-88 (night fighter), DO-217, HS-129. In all cases the fixed gun is mounted in the nose. Each of the following flying boats carries one or more of these guns in hydraulically-operated power turrets; BR-138-B, BV-138-C, DO-18-D, DO-18-G.

Construction details of the 151/15 are listed below.

Caliber (nominal)	15 mm (0.591 in)	Length (overall	75 1/2 in
Bore;		Barrel;	
No. of grooves	8	Weight	23 lb 14 oz
Pitch	1 turn in 16 in	Length (overall)	49 1/4 in
Direction	Right hand	Rate of fire;	
Weight (including		AP	740 rpm
(elec. control)	84 lb 1 oz	HE	680 rpm

Some of the differences between the 15-mm and 20-mm caliber 151 type of machine gun are shown in the following summary.

	15-MM Caliber	20-MM Caliber
Barrel:		
Length	49 1/4 in	43 1/2 in
Weight	23 lb 14 oz	22 lb 14 oz
Pitch (rifling)	1 turn in 16 in	1 turn in 23 in
Groove (width)	.157 in	.210 in
Groove (depth)	.009 in	.0105 in
Weight	84 lbs 1 oz	93 1/2 lb
Length (overall)	75 1/2 in	69 5/8 in

In addition, the 20-mm has a shorter chamber and a slightly larger diameter at front end; the body is strengthened on the underside; the housing buffer is different in design internally, and slightly longer. Also, the feed block, the cartridge stop, the electrical layout for cocking, and the bullet guide in front of the feed pawl vary in the two weapons.

QUARTERMASTER

12. SUMMARY OF CAPTURED FUELS AND LUBRICANTS

The following remarks, prepared by the U.S. Ordnance Department, are based upon British reports on the general examination of captured fuels and lubricants. For further information on this subject, see Tactical and Technical Trends, No. 22, p. 36.

*   *   *

a. General

The general high standard and uniformity of captured German materials is noteworthy. Their supply system was found to be functioning well in North Africa and their products were delivered in good condition. The same cannot be

claimed for the Italian materials or for their supply system. Lack of uniformity, improper marking, and the use of substitute materials was common in Italian products.

b. Aviation Gasolines

German aviation fuels are of particular interest. These are of two types: a blue B-4 fuel (bomber grade) of 89 to 91 octane and a green C-3 (fighter grade) of 93 to 96 octane. The B-4 grade consists of a 71.5 to 74 octane base gasoline plus 4.5 to 4.75 cc tetraethyl lead per gallon, while the C-3 grade consists of 83 octane base gasoline plus 4.26 to 4.6 cc of lead. The C-3 fuel is outstanding in that it has a particularly high rich mixture rating which is given as 110 British Engine Performance Rating compared with 100 for British Air Ministry 100 fuel. This appreciation in performance rating with rich mixture is undoubtedly due to the high aromatic content of the green fuel which is reported as 37.42 and 38.59 percent on two samples.

c. Motor Gasolines

The remarkable uniformity of the enemy's aviation gasoline is conspicuously absent in his motor fuels which include gasolines of various compositions, benzol, benzol mistures, and alcohol blends. It would appear that certain of the enemy's vehicles require a higher octane number fuel than others. Relatively poor base stocks with octane numbers as low as 47 are blended with tetraethyl lead, benzol, and alcohol locally. Samples which have been analyzed indicate octane numbers ranging from 54 to 77. Hence there is no indication of a general standard for motor gasoline.

d. Lubricating Oils

(1) German aircraft lubricants are of both solvent treated, straight mineral, and compounded (with viscosity index improvers) types of viscosity grades, SAE 50, 60 and 70. The viscosity index (92.5 average) and general quality are being maintained at a high standard. There is no indication that the Luftwaffe makes use of oils of reduced viscosity during the winter.

(2) Their engine oils and diesel lubricants appear to be for the most part a good quality high viscosity Pennsylvania type or solvent refined German oils without additives. They occur in viscosity grades, SAE 30, 40, 50, 60 and 70. Their gear oils which are in SAE grades 90, 140 and 250, are made from asphaltic (Roumanian) crudes; some of them contain fatty oils. Very few of them are extreme pressure lubricants containing sulfurized fatty oils or chlorinated materials.

It seems to be standard German practice to use the same recoil fluid in buffer and recuperator cylinders for the entire range of artillery. This fluid which is believed to consist of triethylene glycol and water, has no exceptional features.

SIGNAL CORPS

13. GERMAN RADIO "TACTICS"

From North Africa comes a report that when using short-range radio in the clear during combat, it was a frequent occurrence to have conflicting orders come in in excellent English, occasionally in a voice closely resembling that of someone known to the receiving station. Not only would this interference use up precious time, but more time would have to be consumed by broadcasting the message, "Disregard last order". German radio operators often knew American individual officer's names and called them direct. The best "cure" was to shift to another frequency.

GENERAL

14. GERMAN ARMY PROPAGANDA UNITS

Propaganda within Germany, according to an official Allied source, is the responsibility of the Ministry of Propaganda. In occupied countries and in the theaters of war, propaganda is the responsibility of a department in the Supreme Command of the Armed Forces (OKW) known as the Armed Forces Propaganda (Wehrmachtspropaganda or W.Pr.) with headquarters located at 27 Bendlerstrasse in Berlin.

The two authorities work in very close liaison with each other on questions of policy. In addition, the redistribution of all propaganda material received from the occupied countries and the theaters of war is the responsibility of W.Pr. Actually, W. Pr. controls the publications by press, radio, and otherwise, of the Ministry of Propaganda regarding operations by the armed forces and collateral subjects.

W. Pr. is also responsible for the appointment of all propaganda personnel in the occupied countries and the theaters of war.

a. Army Propaganda Units

These comprise four types of units:

1. Propaganda Depot Battalion (Propaganda Ersatz Abteilung)
2. Propaganda Service Battalion (Propaganda Einsatz Abteilung)
3. Propaganda Battalions (Propaganda Abteilungen)
4. Propaganda Companies (Propaganda Kompanien)

Units 2, 3, and 4 are provided by drafts from the Propaganda Depot Battalion. The propaganda companies are numbered in the 501 series and more than fifteen are numbered in the 601-700 series. The battalions appear to be unnumbered and there are also propaganda companies which are unnumbered. Unnumbered battalions and companies bear names which correspond to the country

or territory in which they operate. All personnel belonging to these units are classed as signal corps personnel and wear lemon-yellow piping.

(1) The Propaganda Depot Battalion

This depot battalion is housed in the Propaganda Kompanien Barracks located in Potsdam. It is a pool for trained propagandists awaiting assignment, in addition to being the training center. The battalion consists of four companies: 1st company, journalists: 2nd company, photographers and war artists; 3rd company, war reporters; 4th company, depot company, which includes administrative personnel, and personnel who have returned to the depot after completing a tour of duty.

In addition there is a section for radio propaganda experts. Recruits are mainly men who in civil life were journalists, press photographers or film cameramen. They receive normal infantry training and frequently are sent on courses of from 4 to 6 weeks duration at the Ministry of Propaganda.

(2) The Propaganda Service Battalion

This battalion has its HQ in Potsdam in the same barracks as the Depot Battalion. It consists of two companies: 1st company, a pool of linguists; 2nd company, called the Propaganda Liaison Company (Propaganda Verbindungskompanie which provides personnel for ensuring the transit of propaganda material (including periodicals and daily papers), to and from the various branches of the propaganda organization throughout the occupied countries and the theaters of war. Its strength is about 400 men.

(3) Propaganda Battalions

There is one of these in each of the occupied countries. In Russia, there are three. They are concerned with conducting and controlling propaganda among the civil population. Propaganda battalions were formed in advance, for countries about to be invaded, and were among the first to make contact with the civil population. Their principal function in the early stages of occupation appears to be the reassurance of the civil population with a view to rendering assistance in the maintenance of public order, and to assist in the reestablishment of public utilities.

The organization appears to be elastic, as each battalion is modified according to the area in which it works. They have an HQ Section in the chief town or capital, and a section (Staffel) in each of the more important towns. Each section is similarly constituted and has a total personnel of about 30. These include:

Section Commander
Adjutant
Film Censor
Theater Censor
Literary Censor
Advertisement Censor (who controls public speeches and advertisements)

All of these are Sonderführer (special director). The remainder are clerks and orderlies. Sonderführer are personnel with specialist qualifications acquired in civil life. They wear uniform, and are subject to military law. They do not hold military rank, but are classified as ranking with NCOs, platoon, company, battalion, and other commanders.

The organization is clearly shown in France, where there is a Propaganda Battalion HQ in the Hotel Majestic in Paris, and propaganda sections located in Bordeaux, Dijon, and other towns. There are propaganda battalions at Riga, Smolensk and Kremenchug (in the Ukraine) with offices (Aussenstellen) in the smaller towns. There is one such Aussenstelle at Minsk.

The propaganda battalions are controlled by the W.Pr. in Berlin and forward material there. The literary censors control all published matter and keep a watch on all book-shops. Radio transmitting stations are all controlled by the propaganda battalions who appoint switch censors. In Russia the propaganda battalions provide troops with posters, leaflets and illustrated publications to distribute to the inhabitants of villages. Loud speaker vehicles are made available to them and it is laid down that they must include in their propaganda such topics as news favorable to the progress of German troops, the release of prisoners belonging to minority regions, administration of real estate, etc.

(4) Propaganda Companies

Our official source states, a propaganda company consists of the following personnel:

(a) reporters, radio commentators, photographers and cameramen, whose duty it is to secure reports of troops in action, for publication by press and radio, and to take films for inclusion in newsreels.

(b) a welfare section (Betreungstrupp), whose duties include the distribution of literature to the troops and the arranging of entertainments, and the showing of films for the troops.

b. Method of operation

The reporters, radio commentators, photographers and cameramen are allotted to units in action as required. In Africa for example, a war correspondent platoon (Kriegsberichterzug) was attached in August 1942 to the Ramcke (Parachutist) Brigade. This platoon was organized in four "reporter sections" of which two were light, and known as "word and picture sections" (Wort und Bild), and two were heavy, and known as "radio and film" sections (Rundfunk und Film). The two light sections were attached, one following the other, for a period of about three weeks, to the front-line troops. The two heavy sections were attached to units for short periods according to the situation. Films taken in Africa were silent - the dialogue being added later in Germany from records made on a "Magnetophone" and synchronised. In Russia sound films are usually made on the spot. The propaganda company in Africa did not broadcast, but recorded material

for programs and the records were forwarded to Berlin for distribution. For this work there were Spanish, French, English, and Arabic - speaking officers on the roster of the company.

c. Welfare Section

The section possesses a mobile motion picture truck, several mobile film units on trucks, a band wagon, two loud-speaker trucks and a mobile library. A general staff officer, of about lieutenant colonel's rank with the Panzer Army in Africa directed the movements of this equipment, and those in charge of it reported to him once a week. The films, shown by the unit, were those current in Germany and no special propaganda films were shown. The mobile truck gave its shows in the open air using forward projection, with the audience between the screen and the truck. Antiaircraft protection was always provided. Sometimes movies were given in tents.

Periodicals for the troops are produced in the various theaters of war. In Africa the periodical was entitled "Die Oase" (The Oasis) and was produced by a lieutenant with one enlisted helper. The number of copies was limited and a standing order existed that it must not be sent out of Africa.

As regards transport, the propaganda company in Africa had the following, which is probably a typical allotment.

Two small cars (Volkswagen) - one for the company commander
One large car
One mobile movie truck
Four mobile movie outfits on trucks
One ration truck
One office truck
One field kitchen
One clothing truck and armory

The propaganda company in Africa used the regular courier aircraft for forwarding its material to Berlin, though propaganda companies in Russia are known to have aircraft of their own.

15. THE TODT ORGANIZATION AND AFFILIATED SERVICES

The most important of the German semi-military organizations engaged in economic operations is the Todt Organization, abbreviated, O.T. Under the leadership of Dr. Fritz Todt, this organization expanded from a small body in 1933 to an army of half a million in 1941. Much of the success of the O.T. is due to its leader. An engineer and road builder and an early Party member, Dr. Todt combined personal acceptability to the Nazi hierarchy with great administrative ability and drive. The organization created by him represents the most specific Nazi contribution to the war effort, despite the fact that it has historical antecedents in the

First World War.

Beginnings

The first task assigned to Dr. Todt was the construction of the Reich superhighways in 1933. An enterprise was established for this express purpose by law of June 27, 1933, with the official designation of "Company for the Preparation of Reich Motorways."

Work began on the roads in 1933; 100,000 men were employed in 1934, with an additional 150,000 men employed on work connected with the highway construction such as the construction of bridges, work in quarries, etc. In 1935 some 250,000 persons were employed directly or indirectly in this work. By the end of 1937, 2,000 kilometers (1250 miles) of highways had been built and an estimated 1,000 kilometers (625 miles) were completed in each of the following two years.

The Westwall

The efficiency of the organization in carrying out the highway construction was such as to lead to its next major assignment in 1938, the completion of the Westwall. The fortification work begun in 1936 by the Army under the direction of its own engineers was not satisfactory to Hitler, who ordered Todt to take over the construction work on May 28, 1938.

It was for this task that the O. T. as such was founded. With Army engineers retained as advisers on the technical aspects of the fortifications, a civilian organization was set up by Todt from headquarters at Wiesbaden to complete the construction.

A variety of organizations were called upon to contribute materials, equipment and personnel to the O. T. One-third of the production of the cement industry was required. Additional excavators, concrete mixers, pneumatic drills, tractors, and trucks were requisitioned from the private construction industry. Large numbers of freight cars from the Reich railroads were permanently assigned to the movement of materials and supplies. Two-thirds of the rural bus fleet of the Reich Post Office was turned over to the O.T. Truck drivers, dispatch riders, and traffic control officers from the NSKK (National Socialist Motor Corps) were assigned to the project.

The O. T. began work on the Westwall with 35,000 men on July 20, 1938. This number was increased to 342,000 by October 6, 1938. In addition 90,000 workers were employed by the Staff of Fortification Engineers (Festungspioneerstab) and 100,000 men from the Reich Labor Service. The work on the Westwall was completed in December 1939.

War Activities

The magnitude of the O. T.'s activities increased after the outbreak of hostilities. It operated extensively in Poland, Norway, the Low Countries, and

France on building and construction projects. The most important project undertaken in the West was the construction of the Second Westwall (the so-called Atlantic Wall) along the Atlantic coast from Kirkenes, near the North Cape, to the Spanish - French frontier.

On the Eastern Front several vitally important tasks have been performed by the O. T. The maintenance of the Russian road system in operating condition is its most difficult assignment, one involving the continuous employment of thousands of laborers. In addition, the permanent repair of many of the key bridges in the intermediate zones has been carried out by the O. T.

A typical special task assigned to the O. T. was the transport of supplies to German forces on the central sector of the Eastern Front during the summer and autumn of 1941 before railroad service to Smolensk had been restored. In this task, the O. T. used huge trucks with two trailers (total capacity 30 tons) operating from Berlin and other depots in Germany proper, in trains of from 200 to 300 units, capable of moving 6,000 to 9,000 tons per motor-train--as much as a freight train--and at high speeds. Travelling day and night, such a train could make the run from Berlin to Smolensk (approximately 1,000 miles) and back once a week. Each truck carried 3 drivers, sleeping bunks, and simple cooking and washing facilities. Two of the drivers relieved each other at 2-hour intervals while the third slept. Drivers were classified as civilians and received 180 reichmarks a week, a very high pay for German workers for the extremely trying work; they were chosen for their robust constitutions and many were released from military service for this purpose. Rest and repair stations were located at regular intervals along the route, but stops were few and brief. The unloading near the front and the reloading of captured or damaged war equipment--a large source of scrap metal--took only 3 hours. The turn-around at Berlin was also kept to an absolute time minimum; if a motor needed repairing or overhauling it was simply lifted out and a new one installed with the least possible delay. The road to Smolensk was kept in excellent repair by the O. T. assisted occasionally by Reichs Labor Service units, and breakdowns were very rare.

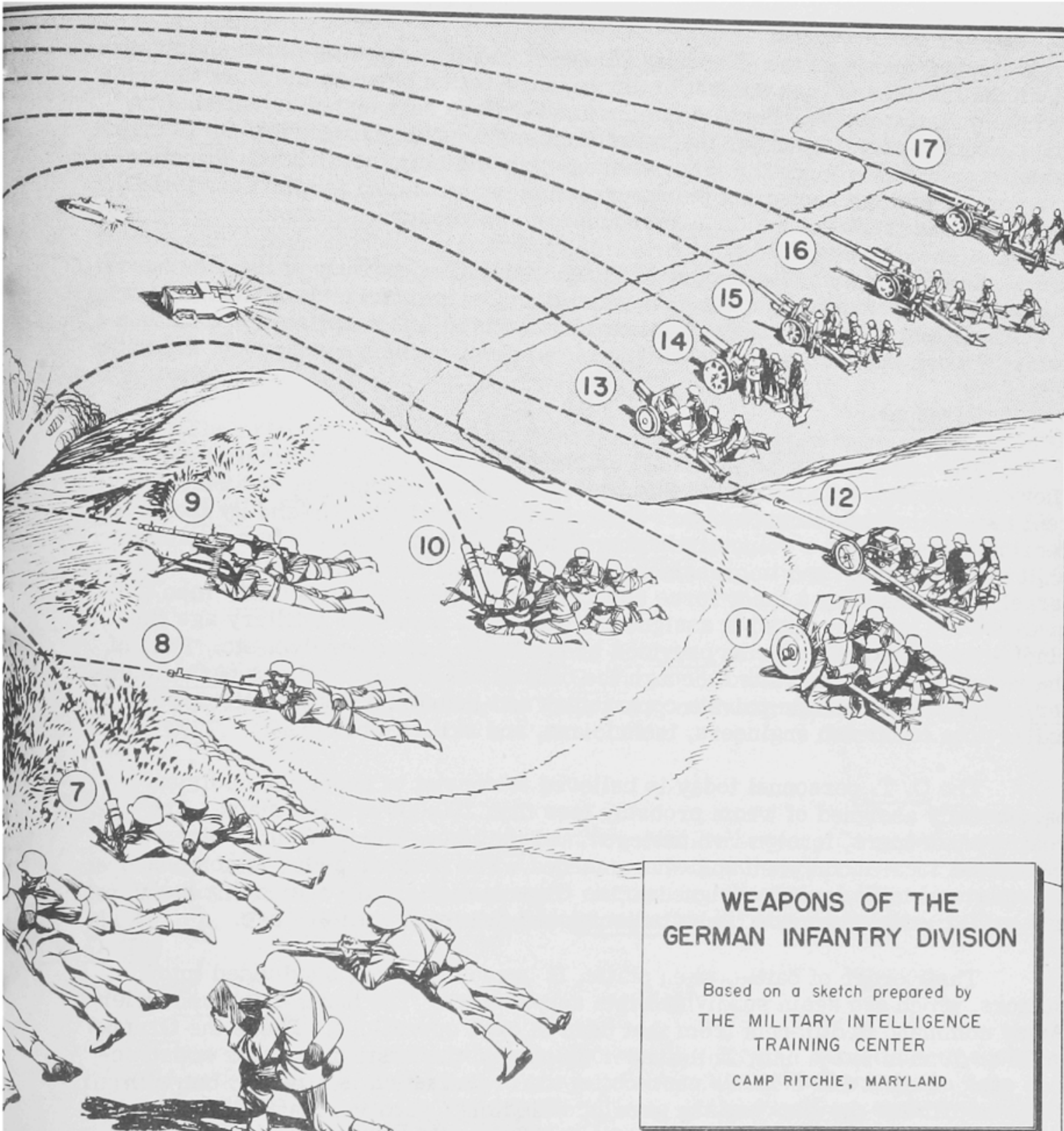
Organization

The O. T. is controlled from the Central Offices at Berlin. Besides the general administrative offices, there are a number of departments in charge of such special activities as rail transport, road transport, repair services, and day and night surveillance services.

The various field projects of the O. T. when not working under army command, are supervised by local "chief works departments" which maintain direct liaison with Berlin. The workers on these fields projects are quartered in "chief camps", each of which is under the command of a camp commander (Lagerführer). The men in each camp are divided into groups (Gruppen) of 25 or 30 workers, which are led by a Gruppenführer, and sent as units to the construction project.

The working facilities, housing, sanitary conditions, etc., of the men on the various projects are the responsibility of a "Front Control" A subdivision of this

1 SEITENGEWEHR	2 HANDGRANATE	3 PISTOLE	4 MASCHINENPISTOLE	5 GEWEHR 98K	6 LEICHTES MASCHINENGEWEHR 34	7 LEICHTER GRANATWERFER	8 PANZERBUCHSE 39
BAYONET Length - 15 1/2 Carried by all riflemen	HANDGRENADE Delay Fuze - 4 1/2 sec Danger Radius - 20 yds Variable number per rifleman	PISTOL Cal - .35 Semi-Automatic Carried by personnel who do not carry rifle or submachine gun	SUB MACHINE GUN Cal - 35 - Automatic Eff Range - to 200 yds Used by small unit leaders and company commander	RIFLE Cal - .31 Eff Range - 400 yds Six per squad	LIGHT MACHINE GUN Cal - .31 Eff Range - 800 yds Rate of Fire - 100/150 rpm One per squad (Model 42 now being manufactured)	50-mm MORTAR Eff Range - 350 yds Rate of Fire - 6 rds - 9 sec Danger Radius - 25 yds One per platoon	AT RIFLE Cal - .31 Eff Range - 200 yds Rate of Fire-6/8 rpm Three per rifle company



	10	11	12	13	14	15	16	17
ER	SCHWERER GRANATWERFER	3.7 cm PAK	5 cm PAK	7.5 cm LEICHTES INF GESCHUTZ	15 cm SCHWERES INF GESCHUTZ	10.5 cm LEICHTE FELDHAUBITZE	15 cm SCHWERE FELDHAUBITZE	10 cm KANONE
UN	81-mm MORTAR	37-mm AT GUN	50-mm AT GUN	75-mm INF HOWITZER	150-mm INF HOWITZER	105-mm GUN HOWITZER	150-mm HOWITZER	105-mm GUN
m	Eff Range - 1200 yds Rate of Fire-20/25 rpm Danger Radius 35 yds Six per MG Company	Eff Range - 800 yds Rate of Fire - 15 rpm Twelve per AT Co in Infantry Regiment	Eff Range - 1000 yds Rate of Fire - 16 rpm Eighteen per AT Battalion in Infantry Division	Max Range - 3900 yds Rate of Fire-10/20 rpm Six per Howitzer Company in Infantry Regiment	Max Range - 6000 yds Rate of Fire-5 rpm Two per Howitzer Company in Infantry Regiment	Max Range - 12,000 yds Twelve per light battalion in Division Artillery	Max Range - 16,500 yds Eight per medium battalion in Division Artillery	Max Range - 20,000 yds Four per medium battalion in Division Artillery

organization, known as the "Security Service" conducts investigations and supervises the transfer of men subject to disciplinary action between the work camps and the punitive camps. In these camps, the men are segregated by nationality, and perform heavy duty under the surveillance of armed guards. The O. T. maintains its own police force for internal security and discipline. The O. T. police are responsible for protecting the construction projects, and for the safety of the trains and trucks of the O. T. en route to the projects.

The medical service of the O. T. functions independently of the other services. It is supervised by a surgeon-general in Berlin and is administered on a regional basis, with itinerant physicians and dentists, and hospitals for each camp of more than 500 men.

Personnel

The total number of personnel employed by the O. T. is not definitely known. However, it is estimated that over 500,000 were employed in 1941. Recent reports indicate a much higher figure in 1942 and 1943. Originally the O. T. recruited workers on a voluntary basis. Since then there has been a complete shift to conscription and impressment. The construction of the Westwall was largely undertaken by a labor force conscripted in one way or another:- men qualified for military duty but assigned to the O. T., men over military age (including ex-service men), men provided by the Reich Labor Service, etc. Part of the labor force was recruited through the official employment offices (Arbeitsämter). In addition, certain private contractors and industrial organizations were called upon to furnish engineers, technicians, and skilled workers.

The O. T. personnel today is believed to consist of about 450,000 men permanently assigned of whom probably less than 200,000 are Germans. The rest are prisoners, foreign "volunteers" and the like. The O. T. also hires or impresses local labor when and where needed. The German cadre is composed of experts of military age assigned to the Organization, young men doing their pre-military labor service (Arbeitsdienst) and men over military age.

Their order of battle, when static, is based on areas, subdivided into sectors, which are again subdivided into sub-sectors. The basic unit when under Army command is different from that used in civil operations. There the Gruppe of 25 or 30 men is the unit, while under the Army, the basic unit is the construction gang of about 100 men. When mobile, the organization is similar, but with different names. In this case the area is called the Operation Staff (Einsatzstab) and is normally under the command of Army Group Headquarters.

Affiliated Service Organizations

(1) Bautruppen (Construction Troops)

To deal with the enormous number of engineering problems that confront a modern army, the German Army has resorted to three principal groups: first-line pioneer troops; second-line engineer troops, the so-called Bautruppen,

organized on a battalion basis, and the O. T. units.

As we have seen, the O. T. units are semi-military in organization, and normally the farthest removed from the front. The regular pioneer troops are absorbed in front-line tasks. In between them and the O. T. are the Bautruppen, definitely military in character, but reserved for such tasks as bridge construction (Brückenbaubataillone) of a more permanent kind, road building, railway (Eisenbahnbaubataillone), and fortification works (Festungsbaubataillone). These troops had their prototype in the First World War, when the regular pioneer troops proved insufficient in number to handle all the repair jobs. At that time private construction firms were called upon to furnish technical personnel and skilled workers, who were organized into special mobile units for emergency construction work.

The principal periods of usefulness of the Bautruppen were the May 1940 campaign and the opening months of the Eastern Campaign. Since late 1941 the original Bautruppen personnel has been increasingly absorbed into front-line duty and the O. T. has had to take over much of the more permanent construction and repair work originally assigned to the Bautruppen.

(2) NSKK

The NSKK (Nazionalsozialistisches Kraftfahrkorps - Nazi Motor Corps) provides the drivers and trucks for the O. T. In organization it is similar to the O. T., but has less independence, its units being normally subordinated to units of the O. T.

(3) TNH

The TNH (Technische Nothilfe - Technical Emergency Corps) also works in closely with the O. T. It is however, a more skilled organization consisting for the most part of specialists in such matters as oil wells, hydro-electric plants, etc. The TNH will normally draw any manual labor it may need from the O. T.

Civilian Firms

The O. T. can and often does control civilian firms. Sometimes the whole firm is put to work, at others only the equipment is hired. Many civilian contractors worked for the O. T. during the building of the Westwall, and French firms are known to be working on the Atlantic defenses at present.

Uniform and Pay

(a) Uniform Originally only the German members of the O. T. wore a uniform, consisting of a khaki tunic, open at the throat. On the sleeve is a red brassard with a black swastika in a circle on a white background. About three inches above the left cuff is a narrow band with the words Org. Todt in white

Gothic lettering. The belt is black with a plain buckle. Army boots are worn. Foreign workers normally wear civilian clothes with a grey brassard on which is stitched the unit or squad number. It appears, however, the foreigners who are willing are now being put into uniform and that they receive higher pay in consequence. If in uniform, foreigners wear distinguishing piping, showing their nationality, on their shoulder straps.

(b) Pay Previously, pay in the O. T. varied greatly. It has recently been reorganized, and it is now believed that all full time German employees receive soldier's pay plus bonuses and that an allowance is paid direct to their families. Foreigners usually receive a small wage.

Conclusion

The O. T. contributes a great deal to the German war effort. That the army can spare so many trained engineers to a para-military organization is explained by the fact that the O. T. does carry a great deal of the work which would otherwise be the responsibility of the army engineers. That the O. T. is now stretched to a surprising degree, and the fact that it is capable of doing so much and such valuable work at such great distances from Germany is yet another proof of the genius for organization of the Germans.

SECTION II

NOTES ON COMBAT

NOTES ON COMBAT

Present-day methods of warfare embrace many problems hitherto absent or completely non-existent in previous wars. Specific admonitions emphasizing the importance of some of these questions, such as the necessity for good discipline, the conduct of troops under varying conditions of combat, and other factors influencing the success of operations, are contained in the following extracts from a letter of instruction to Corps, Divisions, and Separate Brigade Commanders, and from a report entitled "Notes on Combat," both by Lieutenant General G. S. Patton, Jr., now commanding the U.S. Seventh Army. These documents were written as the result of American experience in Tunisia. As stated by General Patton, nothing herein is in material disagreement with our training doctrine, his purpose being to stress certain points.

* * *

a. Discipline

There is only one sort of discipline - perfect discipline. Men cannot have good battle discipline and poor administrative discipline. Discipline is based on pride in the profession of arms, on meticulous attention to details, and on mutual respect and confidence. Discipline must be a habit so ingrained that it is stronger than the excitement of battle or the fear of death.

Discipline can only be obtained when all officers are so imbued with the sense of their lawful obligation to their men and to their country that they cannot tolerate negligences. Officers who fail to correct errors or to praise excellence are valueless in peace and dangerous misfits in war. Officers must assert themselves by example and by voice.

Currently, many of you have defeated and destroyed the finest troops Germany possesses. This should make your men proud. This should make you proud. This should imbue your units with unconquerable self-confidence and pride in demonstrated ability.

One of the primary purposes of discipline is to produce alertness. A man who is so lethargic that he fails to salute will fall an easy victim to an enemy.

Officers must have self-confidence and men must have confidence in their officers. Close-order drill, meticulously executed for two daily periods not to exceed 30 minutes each when practicable, will go far towards developing confidence and self-confidence.

It must be impressed upon officers that it is their paramount duty to set the example in courage. They must be the last ones to take cover and the first ones to leave cover. They must not show emotion except the emotion of confidence.

Americans, with arms in their hands, are fools as well as cowards to surrender. If they fight on, they will conquer. If they surrender, they will starve. Reports from prisoners of war in Germany indicate that the casualties in prison camps, unintentionally inflicted by our air bombardment, are in excess of those encountered by hostile bombardment on the battlefield. Cowardice must be ruthlessly eliminated.

Present methods of warfare demand a higher discipline than anything we have previously conceived. Discipline can only be insured by meticulous obedience to orders and regulations, to include military courtesy, dress, and behavior. It is absurd to believe that soldiers who cannot be made to wear the proper uniform can be induced to move forward in battle. Officers who fail to perform their duty by correcting small violations and in enforcing proper conduct are incapable of leading. Requiring officers to carry out their duties in the enforcing of discipline brings out in them the latent ability to command in battle. The prime essential to victory is to have all officers obsessed with their obligation to their country and their troops, and imbued with the determination that they cannot fail in the performance of their duty and live with their own conscience.

The regulations as to speed, distance, and intervals between vehicles must be maintained in combat and out. Any driver who violates either should have his driver's permit revoked and be reduced to the grade of basic private.

Any officer, who, while riding in a vehicle, permits the above violations, or who on seeing them fails to take corrective measures, should be tried or fined under the 104th Article of War. Officers are always on duty, and their duty extends to every individual in the U.S. Army, not only just to members of their own organization.

b. Infantry Employment

Infantry occupying a position must use the method of mutually supporting small groups wired in. The fact that they are surrounded does not justify surrender. It should be a matter of pride with troops as well as individuals that they never surrender as long as they have weapons and ammunition.

The absurd practice of advancing by rushes when ground defilade exists must be discontinued. When casualties, due to fire, make movement too costly, artillery observers with the front line infantry must automatically call for smoke on the enemy producing the small-arms casualties. Where casualties result from artillery fire or mortar fire, every effort must be made to neutralize the enemy observation posts by smoke from our own artillery or mortars. As soon as enemy observation is neutralized, the troops formerly pinned down by fire must move because even though the enemy's observation is neutralized he can still lay on his former data, but cannot change his data to cover the movement.

In addition to the ability to march and deploy at night, troops must be able to fight at night both in the moonlight and in the dark. This ability can only be obtained by practice. Troops who cannot fight at night are valueless.

In order to ensure that time is not wasted or confusion caused in setting up mortars and machine guns, the crews of these weapons should have standing gun drill daily both by daylight and in the dark. They should be further instructed in the method of laying by the ladder system.

Reconnaissance is of paramount importance. If small vigorous reconnaissance patrols are sent out before dark, the enemy front can be located, and taking advantage of this knowledge, our troops can move into position from which to attack at dawn, or under favorable circumstances, during the night. Without meticulous reconnaissance, either form of attack is suicide.

c. Tactics

There is no approved solution to any tactical situation. There is only one tactical principle which is not subject to change. It is: "To so use the means at hand as to inflict the maximum amount of wounds, death, and destruction on the enemy in the minimum time." The following points, all of which are as old as war, are emphasized as useful means in obtaining the above result.

The primary mission of armored units is to destroy infantry and artillery. Tank versus tank battles, although sometimes necessary, are expensive and indecisive.

Tanks advancing against other tanks or antitank guns must govern their movement by the existence of cover. In the case of a platoon, when other cover is lacking it is possible for 4 tanks to fire smoke at the located enemy guns or tanks, while the other tank moves to a new position. If tanks are advancing under the supporting fire of other tanks, the supporting tanks must immediately open with smoke on any enemy gun or tank which takes the moving tanks under fire. After an object has been smoked, HE, or when the range permits, machine guns, should be fired into the smoke to prevent movement. When, or if, it is desirable to slow up or halt tanks before they are within effective armor-piercing range, the use of smoke is indicated.

Never attack strength - "Catch the enemy by the nose with fire and kick him in the pants with fire emplaced through movement." You can never be too strong. Get every man and gun you can secure provided it does not delay your attack.

In battle, casualties vary directly with the time you are exposed to effective fire. Your own fire reduces the effectiveness and volume of the enemy's fire, while rapidity of attack shortens the time of exposure.

Our mortars and our artillery are superb weapons when they are firing. When silent, they are junk--see that they fire!

Flat trajectory fire against machine guns must be delivered from a position near the axis of enemy fire. This pins the enemy down until the grenadier with the bomb and bayonet kills him from behind.

Few men are killed by bayonets, but many are scared by them. Having the bayonet fixed makes our men want to close. Only the threat to close will defeat a determined enemy. Bayonets must be sharpened. Owing to the size and strength of our men, they are invincible with the bayonet. They must know this.

In mountain warfare the highest peak must be taken first so as to insure observation and permit subsequent attacks down hill. This is best done by a night attack by a small unit which must seize the peak and be reinforced at dawn twilight by sufficient troops to hold it. To reinforce in the dark may cause confusion and firing on friendly troops.

In forcing a pass secure the heights first. There are always trails leading to the rear of hills. It must always be remembered that inviting lines of approach are invariably defended, and an advance by such lanes, without securing the heights covering them, is almost suicidal.

Movement across country at night is very slow; therefore the enemy will stick to the roads as long as possible. Patrols well out, observing the roads, will find him, but if they sit right on the roads, they will be captured.

Never take counsel of your fears. The enemy is more worried than you are. Numerical superiority, while useful, is not vital to successful offensive action. The fact that you are attacking induces the enemy to believe that you are stronger than he is.

Battles are fought by platoons and squads. Place emphasis on small unit combat instruction so that it is conducted with the same precision as close-order drill. A good solution applied with vigor <u>now</u> is better than a perfect solution ten minutes later.

In battle, small forces - platoons, companies, and even battalions - can do one of three things, go forward, halt, or run. If they halt, they will be destroyed in place. If they run, they will be an even easier target. Therefore, they must go forward. When caught under fire, particularly of artillery, advance out of it; never retreat from it. Artillery very seldom shortens its range.

IN CASE OF DOUBT, ATTACK!

Oral orders will be repeated back.

The tendency prevalent in lower echelons of issuing inaccurate and conversational orders will not be permitted. Orders to a squad must be as exact, though much shorter, than orders to any army corps.

Mine fields, while dangerous, are not impassable. They are far less of a hazard than an artillery concentration. Troops must move forward through them.

Troops should not deploy into line until forced to do so by enemy fire.

d. Artillery Fire

Artillery concentrations, particularly when combined with the use of smoke, are effective in stopping or destroying tank attacks. In firing on peaks, artillery must not attempt to bracket, but must fire short and work up-hill. When it has good range on the top, it can use smoke to cover an infantry attack or neutralize observation, otherwise it should use shell fire to destroy observation.

In giving close-fire support to our infantry, especially in mountains, the artillery must open well forward and creep back. The observer conducting the fire should be with the infantry.

The use of smoke must be emphasized. A concentration of white phosphorus against enemy tanks will usually immobilize them and frequently cause the crews to leave them. If the crews remain in them, they must put on their gas masks. When tank destroyers, artillery, or tanks engage hostile tanks or antitank guns at decisive ranges, they should have smoke immediately available, so that if they get a miss on the first shot, they can follow it with smoke. This gives them a chance either to maneuver or to catch the enemy when he emerges from the cloud.

Tank attacks against positions defended by artillery or antitank guns should be preceded by high-burst artillery concentrations on the located or probable location of such guns. Tanks with the tops closed can operate under such conditions with perfect impunity, but the enemy will have difficulty in manning his weapons.

e. Armored Reconnaissance

In armored reconnaissance, the following points are of importance. This applies to the reconnaissance troop with infantry divisions and the reconnaissance battalion with armored divisions.

Junior officers in reconnaissance units must be very inquisitive. Their reports must be accurate and factual, not exaggerated. Negative information is frequently more important than positive information. Information not immediately transmitted is valueless.

All members of a reconnaissance troop should know what they are trying to do. Reconnaissance obtained in front of one division must be transmitted to reconnaissance units of adjoining divisions. Troops must not report types of guns or vehicles unless they are certain. The report that three 88's are firing at them may lead to erroneous conclusions. The report should state that three artillery pieces are firing, unless a definite identification is secured.

Reconnaissance units must not lose contact. At night, listening posts off the road are of vital importance. These listening posts should be at least six miles in front of the normal outpost.

Reconnaissance units should not be used for security missions. Their sole purpose is to get information. They must have sufficient strength in tanks,

assault cannon, etc., to obtain this information. They should have direct radio communication with reconnaissance planes.

f. Antiaircraft

When attacked by enemy planes, every weapon must be fired against them.

On the other hand, every effort and every disciplinary measure must be taken to prevent firing against our own planes. If we have relative air superiority, it is better to wait until planes attack before opening fire than it is to shoot down our own planes. On the other hand, our planes should avoid, even when it entails considerable difficulty, coming in from the direction which the enemy would use or just after he has passed.

Commanders are responsible that their antiaircraft guns do not fire on friendly planes. Panicky firing will be rigorously dealt with. By this is meant when one antiaircraft gun opens fire, others immediately join in without identifying the target. Never fire at a plane until you have identified it or it has attacked you.

If attacked by friendly planes, through error, show yellow smoke.

g. Tactics of Landing Operations

All landing operations will be rehearsed on sand tables. These can be improvized on the ground and need not be complicated. The rehearsal should commence with the boats and terminate with the platoons. In each case, the officer in charge of the unit will give, at the sand table, the actual orders or instructions which he will give in battle.

Owing to the fact that we do not always land where we expect to, junior commanders, to include platoons, should know the general as well as the special plan and wherever they land will use their best efforts to insure the success of the general plan. This is always done by offensive action.

Speed and ruthless violence on the beaches is vital. There must be no hesitation in debarking. To linger on the beach is fatal.

In landing operations, retreat is impossible.

Every unit in the assault echelons must have a magnetic azimuth, and where possible, a distant directing point.

The initial objective for each unit in securing the primary beach-head must be specified. It should be a natural terrain feature capable of identification, even in darkness.

Above all else, the assault must push on relentlessly to its objective. You know where you are going; the enemy does not. Utilize the initiative thus afforded.

You must be prepared to smother the beach with fire. To this end, medium tanks, assault cannon, self-propelled guns, mortars, and machine guns should be emplaced on all suitable craft so that they can fire on the beach prior to landing. You will arrange a means of suspending this assault fire when your leading waves have landed.

Guides on beaches must know their jobs and do them.

Antiaircraft weapons will be emplaced on all suitable craft so that they can be fired while at sea. All vehicles possessed of antiaircraft weapons will have them arranged for the immediate opening of fire. Troops will disembark with fixed bayonets. Life belts will be inflated prior to landing. They will be dropped on the beach.

Assault infantry must be provided with the maximum number of large wire cutters. Hand grenades are useful in the assault of the beach.

Vehicles landing over beaches should do so in second; first speed is too slow. Motors must be wide open as the vehicles hit the water or beach. Maximum speed across sand is necessary. Motors must be warmed-up ten minutes before craft grounds.

In landing operations, intelligent reduction of tire pressure is vital to the successful crossing of beaches and sand dunes. All vehicles, including artillery tractors, will have tire pressures as follows:

VEHICLES	PRESSURE IN LBS
Truck, 1/4-ton, 4 x 4	6
Truck, 3/4-ton, 4 x 4, command and reconnaissance	15
Truck, 2 1/2-ton, 6 x 6, amphibian	12
Truck, 2 1/2-ton, 6 x 6, cargo	15
Truck, 4-ton, 6 x 6, cargo, with winch	15
All half-tracks, combat tires completely deflated	
All trailers will carry normal pressure.	

h. Maintenance

Weapons will be kept in perfect working order at all times. This should be checked frequently by officers and non-commissioned officers.

Vehicles will be properly maintained in combat as elsewhere. Particular attention must be given to tire pressure, lubrication, and the batteries.

Upon the completion of each phase of an operation, all vehicles will be serviced and replenished, so that the next phase may be started without delay.

Commanders are responsible that all vehicles are marked in accordance with Paragraphs 6-14, AR 850-5.

i. Medical

Each soldier will be provided with one bottle of twenty-four (24) halazone tablets for purifying water. A first-aid packet, consisting of a dressing, sulfanilamide powder, and sulfadiazine or sulfanilamide tablets, will be carried at all times within the first-aid pouch.

j. Miscellaneous

Whenever troops have gained a position which they purpose to hold, they must immediately mine it. Time and effort can be saved if part of the mine field is dummy.

In the location of towed antitank guns, these guns must be emplaced where they can neither see nor be seen beyond their effective antitank range. They must be dug in.

Every effort must be made to maintain wire communication to the front. The value of wire communication cannot be overstated.

Where a command post using radio is in position more than six hours, the radio vehicles must be under remote control wire from the command post and at a distance of from half a mile to a mile away from it. If this is not done, the enemy will get radio bearing intercepts and be able to locate the command post for air attack.

k. Conclusion

We can only conquer by attacking.

In landing operations, continued ruthless pressure by day and by night is vital.

In the initial phases of any campaign, we must be particularly emphatic in the ruthless destruction of the enemy. Remember that a pint of sweat will save a gallon of blood!

SECTION III

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TACTICAL AND TECHNICAL TRENDS, ISSUES 21-30 (INCLUSIVE)

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TACTICAL AND TECHNICAL TRENDS, ISSUES 21-30 (INCLUSIVE)

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